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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME XV.

JANUARY TO DECEMBER 1916.

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ERRATA in VOL. XV.

p. 90. *for* Amlyomma variegatum *read* 'Amblyomma variegatum'.
„ „ „ Thiphia parallela *read* 'Tiphia parallela'.
p. 92. „ tetse tetse *read* 'tsetse'.
p. 121 „ Agave cantala *read* 'Agave Cantula'.
p. 122 „ Kiskeedes *read* 'Kiskadees'.
p. 219 „ Luchnost erna sp. *read* 'Lachnosterna sp'.
p. 265 „ Parasitnology *read* 'Parasitology'.
p. 290 „ contra-destruction *read* 'contra-distinction'.
p. 298 „ direct manures *read* 'direct measures'.
p. 363 „ Thermesia digitalis *read* 'Thermesia gemmatalis.'.

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VOL. XV. No. 357. BARBADOS, JANUARY 1, 1916. PRICE 1d.

GOVERNMENT BOTANICAL GARDENS BUREAU OF ECONOMIC BOTANY LAL-BAGH, BANGALORE SEP 6 1916

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At a Distance.

LOCATED away from its immediate sphere of influence, the Imperial Department of Agriculture for the West Indies, in spite of all the many disadvantages attendant on such a position, is at least able to regard the internal affairs of the different colonies in true perspective. Its position is somewhat like that of an experienced person who has been requested to attend and criticize the rehearsals of a play. He sees at a different angle from the individual actors, no matter how great their ability, and although his suggestions may not always seem acceptable, they should not be ignored, because of his experience and point of view. To continue the metaphor, it may be reasonably added that the ultimate credit in the eyes of the public will fall upon the players, so that the director's work ends with the success of his actors, or, in other words, is epiphytic on failure.

Looking at the islands from a distance, one can see at the present time a number of performances in progress, the majority of them very serious, though a few are not without a touch of comedy. In Barbados and the Leeward Islands we have the annual repetitions of the sugar-cane experiments, which, in spite of a certain inevitable sameness of presentation, are well appreciated by certain sections of the public. New varieties are introduced each year, and in course of time these are made use of by the planter. In certain directions, particularly in Barbados, it would seem that some re-arrangement of the programme might be an advantage, especially in regard to the manurial experiments; but the actual effecting of this change rests, of course, with the local authorities.

Of recent years each island has tended more and more to produce its own selected seed for cotton planting. This performance, like that with sugar-cane, is repeated annually, and also, like the last mentioned, continuous repetition is its most important feature. Cotton growers fully appreciate the value of this work; for one thing it must tend to secure uniformity in each colony's cotton, which is what the users most desire. Such a performance, therefore, may be calculated to have a long run.

As well as being the scene of Governmental action along these two outstanding lines, the smaller islands have their minor plays or side-shows. An interesting one of quite recent production is the St. Lucia Lime Juice Factory, which is a source of great satisfaction to the peasantry, and is also freely patronised by the larger owners, who of course, in many cases, possess factories of their own. The venture has interested the large owner in both St. Lucia and Dominica, in so far as it has shown that it can reduce the loss in acid during concentration, as well as the amount of sediment in the juice to quite a remarkable extent.

Other side-shows of much interest are on the premises of the Antigua Onion Growers' Association and the Government Kiln-drier for Indian corn. The first named is rapidly growing in interest, and has been initiated with success in Montserrat and the Virgin Islands. The moral is co-operation; and, indeed, this holds good for most of these new productions. It is a very popular theme at present, and one hopes that it will continue to be so.

A most pleasing feature of this co-operative trend is the formation within the last year or two of co-operative credit societies. This is the very quintescence of co-operation, for if we can trust each other with money, we can do so in regard to most things.

It will be understood that in all the instances we have referred to above, it is the local Governments which have produced the money and the principal actors; there has been very little private enterprise. As for the Imperial Department, it is not perhaps too much to claim that that institution has originated the ideas and the working plans to a not inconsiderable extent. But as already intimated, that form of effort ends with success, just as it would not end in the event of failure.

While Governmental action has predominated, it must not be thought that private enterprise has been entirely absent. Most of the islands have of recent years been the scene of coco-nut planting on an extending scale, and we must not fail to recognize the important part played by the pioneers in this direction, as well as that played by those who have been responsible for the planting of land in limes and other crops in places like St. Lucia and Dominica.

Looking at a distance we notice one feature of administration in both official and business circles that needs amendment. When a so-called new scheme is being introduced, there is scarcely ever enough attention given to work that has been done in that direction previously. An examination of past records should never be omitted, for it will often prevent the useless repetition of some experiment which has already been shown to yield unsatisfactory results, and will often save direct mistakes. Besides, it is only fair to credit past workers with their own results, and only rational to start any new scheme, if possible, on a basis of pre-ascertained fact. In connexion with this, one may draw attention to the importance of filing publications for reference—a habit which is regrettably absent even in public offices.

In colonial administration every problem must be regarded on its merits, and according to local circumstances and the experience of others in the past. It is a very unoriginal but nevertheless a true saying that 'there is nothing new under the sun,' and most of the events in colonial development labelled original, are merely the intelligent application of other people's results.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA.—Mr. A. J. Brooks writes to say that during November the cacao crop was satisfactory, and was being harvested during that month. The lime crop was still fairly heavy, while the sugar-cane was very promising throughout the island. During the month, 15 casks of concentrated lime juice were prepared at the factory, making a total of 59 for the present crop. Improvement in relation to the roads and entrances at the Botanic Gardens, and an extension of the drainage system at Réunion continue. In the Experiment Station, work has consisted in preparing lime beds, sowing and transplanting limes, and making 12-inch concrete pipes for drainage purposes. The plants distributed from the Government nurseries during November consisted of the following: limes, 4,825; budded oranges, 42; miscellaneous, 36; cassava cuttings, 3,000; sweet potato cuttings, 5,000; sugar-cane cuttings, 3,000; also 8 packets of vegetable seed.

DOMINICA.—In October the lime crop was slackening off. The local prices for yellow limes advanced from 3*s.* to 4*s.* per barrel, and raw juice from 6*d.* to 7*d.* per gallon. The latest cable quotation for concentrated juice was £28 per pipe. A shipment of juice made by steam concentration realized £35 per pipe. Mr. Joseph Jones, who has furnished the above information, states further that, in connexion with coco-nut cultivation, a 5-acre experimental plot has been approved by authority. Work in the nurseries has consisted in lifting and delivering plants, potting, cutlassing, weeding, transplanting, sowing seeds, budding and spraying. In the lime experiment station the principal operations have consisted in picking and recording the crop, cutlassing, planting

out a number of lime plants budded on new stocks experimentally. Two heavy pickings of cacao were made during the month in the Experiment Station, and the yield from each of the plots was recorded. Work in the Botanic Gardens included the planting out of new species and completing the removal of fallen trees, thrown down during the August and September gales. The following is reported as having been done in the chemical laboratory: investigations to determine the relationship between total acidity and pure citric acid on a number of raw and concentrated juices; also samples of lime juice sent in by planters were tested. As regards laboratory equipment, the presses, fume chamber, working bench, etc., were completed. The rainfall for the month was normal, being 8·41 inches, rain having fallen on twenty-one days. The distribution of plants was: limes, 2,300; cacao, 300; budded citrus, 7; grafted mangoes, 4; total, 2,611.

DOMINICA.—Later advices received in respect of November state that there was a lull in the lime crop to be followed by a small second crop. There was no change in the local prices for lime products. The cable quotations however for concentrated juice dropped to £25 per pipe. The cacao crop was ripening rapidly but much difficulty has been encountered in the drying operations owing to the persistent wet weather. Reference has been made above to the establishment of a 5-acre experiment plot of coco-nuts. The surveying and laying out of the plots for planting was being carried on. In regard to citrus, it is stated that a $\frac{1}{4}$-acre plot of varieties of grape-fruit was planted out, and Mr. Jones is starting a second $\frac{1}{4}$-acre plot of limes budded experimentally. Fruit is still being shipped from Dominica for the wounded soldiers. Amongst the visitors to the Gardens during the month were the Assistant Director of Agriculture, Trinidad; Sir Gilbert Carter, K.C.M.G., formerly Governor of Barbados; and Mr. Driver, late of Montserrat. The rainfall for the month of November was 10·05 inches. The list of plants distributed from the nurseries is as follows: limes 3,400; coffee, 500; budded citrus, 75; shade trees, 75; vanilla, 25; nutmegs, 12; grafted mangoes, 3; miscellaneous, 21: total, 4,111.

MONTSERRAT. It appears from Mr. Robson's statement concerning agricultural conditions in this island during November, that the cotton fields planted in April have given the best results for the season. The general absence of a second growth on cotton plants is remarkable, in view of the satisfactory weather. During November, the destruction of old plants was begun. The continued rain has been of great benefit to lime planters, and the supplies from the old fields are stated to look well. Considerable areas have had applications of artificial manure. Although corn continues to be shipped to St. Kitts and elsewhere, it is not anticipated that there will be any considerable development in its cultivation as a main crop. There is more hope for a suitable bean crop. It appears that considerable trouble was experienced during the month in regard to plant diseases. The pine-apple plot in the Experiment Station is apparently succumbing to disease, and damping off has been an obstacle in the way of an extension of onion cultivation. At the time of writing, cotton stainers were fairly general. Over 3,000 lb. of pedigree cotton seed is on hand for distribution to planters and is being offered to growers, sufficient seed being allowed to plant one-tenth of the total acreage that it is intended to establish. The seed will be used to plant a field which will supply seed for the whole estate in the following year. It is intended to follow up this system each year. Interesting work in the Botanic Gardens has been the planting of beds of the second generation of Ajowan. Seeds of Teff grass were sown and have germinated. The rainfall during the month was well distributed; there has been an absence of downpours.

ANTIGUA. Mr. J. Jackson states that the area under cotton for the present season is 444 acres. Rather severe attacks of cotton caterpillars were experienced during November in some localities. Work in the Experiment Station has included the reaping of sweet potato experiments, and replanting, cutting hedges, cleaning drains, preparing beds for sowing lime seeds, and weeding plots. Coming events of interest include the annual sale of cane plants, the laying out of manurial experiments of sugar-cane, irrigation experiments, and improvements to the onion drying house. The plants distributed during the month of November were: coco-nuts, 575; onion plants, 4,400; Eucalyptus, 213; miscellaneous, 46. A certain quantity of vegetable seed was distributed. At the Botanic Station 8·45 inches of rain fell during the month of November: for the year, 54·35 inches have fallen. The cane crop throughout the island continues to improve, and, on the whole, the cotton crop looks promising.

NEVIS. The cane crop throughout the island, writes Mr. W. Howell, continues very promising and has made rapid growth during the month in consequence of the fine rains. Some anxiety is felt in certain parts of the island with regard to the reaping of the crop. Most of the canes were planted with the hope of selling them to the St. Kitts factory, but it is very doubtful whether the factory will be able to take any canes from Nevis on account of the very large crop to be reaped in St. Kitts. If this happens it will be a source of great disappointment to the Nevis peasants, who in one district alone have over 130 acres under cane. In regard to cotton, the second growth is reported to be looking fairly well in some places, but the return will not be so good as was expected on acccount of boll dropping and leaf-blister mite. The provision crops continue to do well and a fair acreage was planted in sweet potatoes during the month. Work contemplated includes the planting of experimental plots of canes on estates. The rainfall for the month of November was 5·37 inches. Rainfall for year to date, 46·21 inches.

VIRGIN ISLANDS. Mr. Fishlock, who has now resumed his duties as Curator in place of Mr. C. Gomez, writes to say that the crops of canes, limes and cotton will all be small. Cotton, however, is showing in many instances marked recovery since the rain. Work in the Experiment Station has included the sowing of onion seed (which was completed early in November), the weeding of the cotton seed farm, and the mulching of the lime plot. The plants distributed numbered altogether 97,200 This is made up as follows: limes, 300; onions, 96,800; decorative, 100. The weather has been showery with heavy rains on November 26, 27 and 28. The total rainfall for the month was 13·34 inches; average for November during the last fourteen years, 6·65 inches. Later observations relating to staple crops, forwarded by Mr. Fishlock, make it appear that both the cotton and lime crops will be smaller than usual. The same applies to the sugar industry which, of course, in any case, is a very small one. As noted elsewhere in this issue of the *Agricultural News*, much attention is being given to onion cultivation in Tortola. A grub has been observed to be causing damage to onion seedlings, and it is stated that measures have been taken to have this identified at this Office with a view to its control.



CURING VANILLA.

It would appear that the process of curing Vanilla has as its basis the following course of events.

The pods are first plunged for a few seconds into boiling water: this has the effect of killing some of the more superficial cells, thus permitting the diffusion of the enzyme or ferment from one cell to another. Living cells inhibit the movement of the enzyme. On reaching the other cells the enzyme acts upon the glucoside from which vanillin results and the fragrant odour of vanilla is developed.

The next operation consists in sweating the pods. It would seem that this operation has for its object the promotion of the death of more cells, and progressively the death of all, coupled with the steady diffusion of the enzyme from cell to cell, and the liberation of the whole of the vanillin. During this part of the process the object is to keep the pods warm and moist; drying is prevented, thus aiding the death of the cells, and the diffusion of the enzyme. The progress of the changes is ascertained by the expert curer from the feel of the pods as they change from the fresh state, containing living cells, to the stage in which the cells are dead and the vanillin liberated. This constitutes the main features of the art of the curer.

When the changes described are completed, the next object is to dry the pods sufficiently to enable them to keep; this being done, the vanilla is ready for bundling for sale.

The drying is accomplished by placing the trays of fermented pods in a cool well ventilated place, out of the light.

The middle stage is obviously the important and difficult one. It might be experimentally carried out as follows.

The pods, after being plunged in boiling water, should be placed in a glass-topped box exposed to the sun. The temperature inside the box would quickly rise to a considerable degree, and this could be regulated, as experience dictates, by shading by means of cloths or other forms of shade over the glass top of the box.

The work might be done in an apparatus somewhat resembling a cucumber frame; this might be made of any convenient size, from a small experimental apparatus up to a large commercial one. The chamber of the apparatus should be fitted with shelves or racks on which the vanilla pods may be laid in shallow trays. Access may be had to the interior by means of doors suitably placed at the sides and ends to enable the trays to be put in and their contents examined freely.

It would be useful if experiments were conducted on the lines here indicated.

It may be pointed out that the protoplasm of cells is killed by exposure to temperatures of about 65° to 70° C., while the enzyme will stand a somewhat higher temperature, its power of inducing change is, however, destroyed at temperatures somewhat below 100° C.



ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT FOR 1914-15.

During the year under review, Mr. W. N. Sands, the Agricultural Superintendent, was for a considerable part of the time absent in England on leave. In his place Mr. Birkinshaw, transferred later on to Mauritius, acted as Agricultural Superintendent. Connected with Mr. Sands' absence is an interesting section of the report entitled The Extension of Interest in the Colony's Products. While in England Mr. Sands went to considerable trouble in the matter of extending interest in the colony's products, and conducted an inquiry in connexion with cotton that has led to the introduction of a new type which may take the place of Marie Galante. The new cotton possesses characters which prove it to be botanically a variety of *Gossypium peruvianum*. The plant is more vigorous and produces a finer lint than the ordinary Marie Galante. Connected with this line of activity were the efforts made at the International Rubber and Tropical Products Exhibition held at the Royal Agricultural Hall, London. A lengthy extract from Mr. Sands' report, as representative of St. Vincent, is included in the publication under review. Mr. Sands says: 'it is difficult to estimate the value to the Colony of participation in exhibitions such as this. It is certain that our products were brought permanently to the notice of a large number of influential people and business men, and in this way alone, leaving out the educational side, I consider that for the comparatively small expenditure incurred, the Colony's display was well worth while.'

As well as at the above exhibition, St. Vincent was represented during the year at the Canadian National Exhibition at Toronto.

Turning to the internal work of the Department we notice that in the nurseries there was, as usual, considerable activity during the year. The improvement of the sugar market was a cause for considerable enquiry for sugar-cane cuttings, while, as usual, a large number of cacao and coco-nut plants were sent out. The importance of growing foodstuffs in view of the war led to the distribution of a considerable quantity of seeds. In connexion with the inspection and fumigation of imported plants and seeds under the Act of 1906, more than usual work was thrown upon the Department during the year under review. When it is stated that no less than 46,650 coco-nuts had to be inspected and in many cases fumigated, it will be realized that the work entailed with these alone was considerable.

The plot experiments described in the report included some interesting manurial trials with Sea Island cotton and arrowroot. While these are of interest, they have not yet been long enough in progress to yield definite results. Useful work has been in progress in connexion with efforts to raise new strains of cotton, particularly one in which there is combined, resistance to disease with other

desirable characteristics; and of continued interest is the selection of plants bearing four- and five-locked bolls, which were shown last year to yield more lint than the more normal fruits of the cotton plant. The remaining plot experiments have included a test as to the effect of the method of planting on cassava, which has indicated a yield in the case of flat planting higher than in the case where ridges or banks were employed. A similar experiment was carried out with Bermuda onions. One plot was sown in rows on flat-forked land, another had the seedlings transplanted on to banks, and in a third plot the seed was sown in drills on banks. The transplanted seedlings gave a calculated yield of 7,200 lb. of onions per acre as against 2,966 in the case of the first plot, and 2,365 in the case of the third. Further experiments on a larger scale will be undertaken at the experiment station and on estates this season.

In connexion with progress in the chief industries, two tables are given in the report showing the annual returns relating to cotton since 1905-6; (a) as regards the amount actually reaped, and (b) the seasonal exports. The quantity exported during the last two years has been somewhat below the two preceding years. The shipments of starches and cacao are also recorded in tables. The cacao industry seems to remain in much the same state.

Progress in the minor industries centres principally around coco-nuts, ground nuts, peas and beans, and limes. It is estimated that considerably over 1,000 acres have been planted up in coco-nuts during the past six years and, taken as a whole, the outlook for this new industry is full of promise.

Details of administration at the end of the report refer to the usual matters of routine, and include meteorological observations which show that the rainfall recorded at the Botanic Gardens for the year 1914 was 98·49 inches, which was 7·47 inches below the mean of the previous twenty years. It was not well distributed, November being a very wet month instead of what it usually is—a fairly dry one.

The report of the Government Veterinary Surgeon attached to Mr. Sands' report, shows that five cases of anthrax occurred during the year. Measures were taken to enclose the infected area, and the extensive vaccination work continues as in previous years. While the loss on account of the deaths referred to is unfortunate, yet its limited extent may be regarded as usefully significant of the good general control over anthrax and the need for continued vigilance, exercised by the Government Veterinary Surgeon, Mr. C. P. Stoute, under existing arrangements.

Director, Mr. W. Hopkins, hopes that the people of the country in future may be induced to take up this cultivation with a view to preparing concentrated juice and lime oils for the English market.

A good deal of experimental work has been done in Sierra Leone with different varieties of rice, and information in this report will no doubt interest agricultural officers in Trinidad and British Guiana, particularly in the latter Colony, because some of their varieties have been under trial in Sierra Leone.

During 1914 the ground nut crop was a failure owing to bad germination and the attacks of a disease, probably *Cercospora personata*. In the variety trials with ground nuts the yield varied to the extent of 548lb. and 174lb. per acre in the different plots. Similarly in the maize experiments one plot gave as much as 582lb. per acre whereas another gave only 296lb. In the first case, however, the previous crop had been ground nuts, and the soil had been deep-hoed, while in the second the previous crop had been maize and the soil had not been deep-hoed.

It does not appear that much progress is being made with cotton growing in Sierra Leone. On the other hand, it seems that the area under cacao is extending, and that the trees would flourish provided that, where necessary, the natives would plant protective belts of trees in order to shield the cacao from the prevailing winds. The price offered for cacao by the traders to the natives is very low, about $1\frac{1}{2}d.$ per lb., therefore there is a probability that the industry may be killed in its infancy by underpaying in this manner.

An interesting feature of the publication under review is the report on the soils of Sierra Leone based upon results of examination of soil samples at the Imperial Institute. All the soils with the exception of one, were found to be deficient in calcium carbonate, and it is stated that they would benefit by the application of a dressing of slaked lime. In all cases except one, the percentage of nitrogen was satisfactory. All the soils contained adequate supplies of humus for most crops. In some of the samples, however, the reserve of phosphoric acid was low, while the reserve of potash was also deficient in most cases. It would appear, however, that the amount of available potash is satisfactory. Needless to say, the above information can only be of use to those having an intimate working knowledge of the soils in question. It is of general interest, however, as another contribution to our still scanty store of information on tropical soils.

SIERRA LEONE: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914.

Agricultural officers in the West Indies may remember that Mr. D. W. Scotland, the Assistant Director of Agriculture, Sierra Leone, paid a visit to these islands in 1914. The present report, therefore, might be expected to possess points of special interest, particularly in regard to the cultivation of limes in Sierra Leone. It is stated that the lime plantation at Jala is now two years old. The trees have grown very well, and at the end of the year will be pruned. It is said they compare very favourably with three-year-old plants in the West Indies. The lime tree grows well in Sierra Leone, both in the Colony and in the Protectorate, and a Pamphlet entitled The Prospects of Lime Cultivation in Sierra Leone has been prepared by the Assistant Director for distribution amongst the District Commissioners and others. The

A note appears in *The Board of Trade Journal* (November 11, 1915), on the need for commercial research work in Canada. It is pointed out that Canada has now reached the stage in its development when the need of more initiative and of more organization in dealing with its opportunities has become clear. Canada appears to the outside world chiefly as an agricultural country. Viewed, however, in the home markets, agriculture is now largely overshadowed by manufactures. The war has been the manufacturer's opportunity for entering the field of foreign trade on a considerable scale. Few of the manufacturing establishments have laboratories and special experts needed for research work. It is therefore satisfactory to know that three important universities—Toronto, McGill and Queen's—have agreed to co-operate with the Dominion Government in research work for the benefit of the manufacturing, mining, agricultural, and forestry interests of the Dominion.

WEST INDIAN COTTON.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 11, 1915, is as follows:—

ISLANDS. The demand has continued again this week taking all the offerings of odd bags classing Fine to Extra Fine at 25c. to 27c., resulting in sales of upwards of 400 bales, the buying being on account of the Northern and Southern Mills. This demand is partly due to the prices ruling here for Islands being lower than those paid in Savannah for Georgias and Floridas, making this market relatively much the cheaper.

The Factors show more disposition to sell the Planters' crop lots, and would make some concession to do so, but at present there is little or no demand.

We quote, viz.:

Extra Fine	27c. to 28c.	= 17*d*.-17½*d*.	c.i.f. & 5 per cent.
Fully Fine	26c.	= 16½*d*.	,, ,, ,, ,,
Fine	25c.	= 16*d*.	,, ,, ,, ,,
Fine off in class	24c.	= 15½*d*.	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. The sales for the week are reported as 1,434 bales, but they were compossed largely of cotton received from the interior by exporters and included in the sales. The exports were 1,263 bales, which are reported as cotton now going forward on sales previously made for December shipment. In Savannah nearly all of the stock in Factors' hands is being held off the market in anticipation of some advance later on. The daily offerings are small, and in such good demand the market is very firm. Throughout the interior the offerings are also limited and in good demand, and to secure them, ½c. advance has been paid this week over the Savannah prices. The interior stocks are also being largely held off the market in anticipation of higher prices later on.

Notwithstanding the Bureau's report of 77,161 bales ginned to the 1st instanf, the general estimates of the final outturn of the crop continue to range from 85,000 bales to 88,000 bales.

We quote, viz.:

Fancy	26c. = 27c., landed.
Extra Choice	25c. = 26c., ,,
Choice	24c. = 25c., ,,
Extra Fine	23c. = 24c., ,,

The Exports from Savannah for the week were, to Northern Mills 1,061 bales, Southern Mills 202 bales, and from Jacksonville to Northern Mills 1,194 bales.

The U.S. Census Bureau reports cotton ginned to December 1 as follows:—

South Carolina	3,374 bales				
Georgia	48,877 ,,	Making a total of	77,161 bales		
Florida	24,910 ,,				
against last year	62,991 bales	Total crop	78,857 bales		
,, 1913	61,049 ,,	,,	,,	85,544	,,
,, 1912	51,275 ,,	,,	,,	66,169	,,
,, 1911	87,656 ,,	,,	,,	122,512	,,

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and forty-first meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday the 2nd inst. Mr. J. Arthur Hutton occupied the chair. A letter was read from the President (The Rt. Hon. The Earl of Derby, K.G.) regretting his inability to attend the meeting owing to important business in London.

WEST AFRICA. The Georgia and Upland varieties of cotton which have been grown this season on the Government Experimental Farm near Ibadan, are doing very well, and the plants are strong and flourishing. This will be the first year that seed over and above the requirements of the Agricultural Department will be available for distribution to planters, and the Association have decided to back up the Government Authorities in every way by paying an extra price for cotton produced from this seed. It is hoped that this experiment will result in establishing a better variety of cotton in Lagos, which will give a higher percentage of lint to seed-cotton, and also a greater yield per acre.

In view of the approach of the new season it will shortly be necessary to decide as to the price to be paid for seed-cotton in Nigeria. Last season the Association commenced by paying ¾*d*. per lb. of seed-cotton, and later the price was increased to ⅞*d*. per lb., and had there been a larger crop and the buying season spread over a longer period, the Association would have further increased the buying price. It is not yet possible to estimate what the production will be next season, but the growing conditions have been most satisfactory; there is a doubt, however, as to what quantity of seed has been planted, and estimates for the new crop range from 10,000 to 15,000 bales. In order to encourage the natives it has been decided to pay the highest price which the market will allow.

The purchases of cotton in Lagos to the end of October amount to 6,050 bales, as compared with 13,511 bales for the same period of last year, and 13,738 bales for 1913.

The purchases of cotton in Northern Nigeria to the end of September amounted to 564 bales, as compared with 523 bales for the same period of last year.

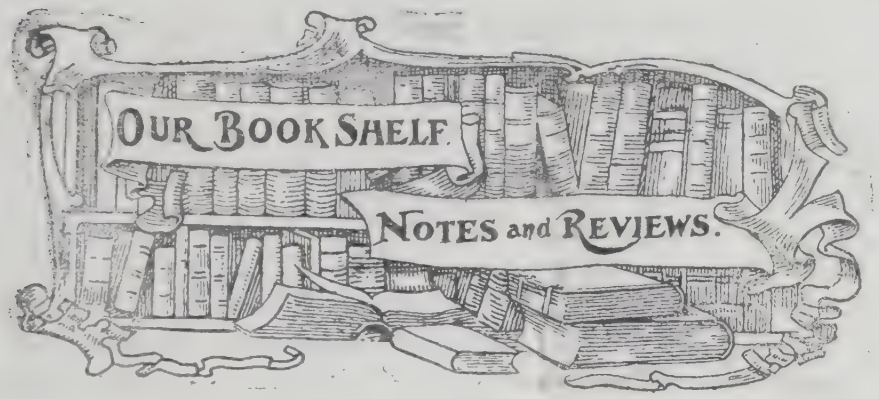
The Association have had an interview with the Director of Agriculture for Northern Nigeria, who is very optimistic as regards the prospects for cotton in certain districts, although in other parts the higher price of other products has affected the production of cotton. The Director of Agriculture is of opinion that considerable quantities of cotton can be produced in Northern Nigeria provided a satisfactory type of seed can be established, which will give the natives a greater production per acre than the local seed, and which will be of better quality, so as to enable the Association to increase the buying price.

SUDAN. The reports of the cotton crops at the various experimental stations are very favourable, but in some districts the crops have been damaged by locusts, and it is estimated that about 20 per cent. has been severely damaged, and although the affected areas have been resown, it is feared that great results need not be expected in these districts, as the season is too far advanced.

UGANDA. It has been decided to continue the Association's operations in Uganda for at least another season, otherwise it is feared the natives may not receive the full market value for their cotton, and a minimum price has been fixed for seed-cotton which it is hoped will give the natives the encouragement which is so essential at the present juncture.

It was mentioned that 4 bales of cotton had been shipped to the Association, the proceeds of which are to be used as part of a contribution by the natives of the Eastern Province to the Prince of Wales' Fund. The Association have agreed to pay the railway and ocean freight, and all charges on this cotton, so that the gross proceeds may be paid to the Fund, and it is hoped that arrangements may be made for the cotton to be specially sold by auction.

It was reported that during the month the Association had sold 4,621 bales of cotton, which was considered very satisfactory, under present conditions.



THE RUBBER INDUSTRY OF THE AMAZON AND HOW ITS SUPREMACY CAN BE MAINTAINED. By Joseph F. Woodroffe and Harold Hamel Smith. With a Foreword by Viscount Bryce, O.M., P.C. *'Tropical Life' Publishing Department, John Bale Sons, and Danielsson, Ltd.*, London, 1915. Pp. 435 + plates 48. Price 21*s.* ($5).

Situated in Barbados, we occupy a position that enables us to know something of Brazil and the Brazilians, more especially of the latter. Before the great Brazilian depression set in, which the authors of this volume hope soon to see dispelled, many of the Brazilians used Barbados as a 'winter' resort. They spent money here and practically established a *quartier Brasil*; but now the houses are for the most part empty, or are occupied by local people, a fact which is not without significance. Apart from this connexion with Brazil, Barbados is the port of call for the main steamship lines between North and South America, so that there are men of business in Barbados who are in a position to form a fairly reliable estimate of Brazil's commercial status of to-day, and in a position to appreciate the interesting proposals which this book puts forward. Finally a further connexion with Brazil lies in the circumstance that we have had the advantage of correspondence with Englishmen holding official positions in that country, like Dr. Willis, late Director of the Botanical Garden at Rio; and lastly, we have had an opportunity of seeing a little of the Brazilian Navy.

As the result of knowledge derived from the foregoing sources, we are inclined to agree with the authors of this volume that there is much need for general reform in Brazil. In nearly all directions, and most of all in the direction of the rubber trade, the present state of affairs indicates marked inefficiency. Viscount Bryce, in his foreword to the present book practically admits it, and the authors themselves prove it, if indeed it is a thing that requires proving. To put it briefly, inefficiency, especially in regard to the Amazon rubber industry, is the *raison d'être* of this work.

It must not be imagined, however, that the authors approach their subject in any aggressive spirit. The motive is entirely beneficent, being primarily in the interests of Brazil itself; and secondarily, in the interest of those countries which have provided Brazil with capital, and will, when the war is over, be willing to provide still more if only investors can be assured of even ordinary security.

Another point which calls for a word of explanation is the authors' attitude in relation to the East. One might be inclined to infer that this book with its suggestions for the betterment of the Brazilian rubber trade constituted a sort of bolstering up of Brazil against our British rubber industry in the East. Those who have interests in the East may, in some instances, see traces of such a policy and object to the book on this account; but an impartial study leads to the conclusion that the objection is unfounded (1) because the authors primarily advocate the production in Brazil of material other than rubber; and (2) because, though the amount of rubber exported may consequently be increased, the authors hope that a combination between East and West may be effected to the benefit of both.

The means of reform suggested to Brazil are stated in the introduction—in a rather restless and sweeping style, perhaps, considering the immensity of the proposals, but none the less plainly—in the following words:—

'(1) To make the collection and preparation of rubber for export subsidiary to agricultural, stock-raising and other industries, and not the main and, in fact, the sole industry that it can well claim to be at present. (2) To increase the population of Amazonas by the introduction of Chinese, Japanese, and other races to clear and settle on the lands available up the Amazon, and whilst forming homesteads and small farms, to tap and cure rubber to obtain "pocket-money", whilst their women and children do the lighter work on the home farms. (3) To ditch, drain and break up, and cultivate the flat, open lands in the rubber zone; to clear and drain the forest areas year by year for the Government, thereby rendering the 300,000,000 untouched rubber trees, believed to be there, available for tapping, whilst the forests would be exploited for their timber and other products, and cattle, and especially pigs introduced (the latter to keep down the snakes), to increase local food supplies and build up an export trade in meat products.'

Although these are the main proposals put forward, it is the first and last chapters of the book which touch upon the two vital questions of Brazilian policy of to-day. These are the Labour Question and the Monroe Doctrine. Brazil is hopelessly deficient in people in relation to her resources, and the people which she does possess are either oppressed or oppressors in one way or another. Mr Hamel Smith says: 'therefore use the indigenous stock to breed from, and in doing so improve the class of man and woman you require as ordinary labourers, peasant proprietors, etc.' We would add that moral tone of those in authority must also be improved. To effect a grading up it is suggested, as already stated, that Asiatics should be more extensively introduced, and the authors show in the course of their writings that Japan is fully alive to the demand for skilled labour in Brazil, and that she has taken organized action in the matter. The authors say very little concerning the German influence in Brazil, assuming, we suppose, that this is at an end. Taken as a whole, the anthropological problems in Brazil are extremely complex, and will require the most careful consideration.

The second great question is the effect of the Monroe Doctrine on the development of Brazil. This is a political matter with which we are not in a position to deal, but we gather from the book under review that many people in Europe, Brazil and the United States consider that its present day interpretation is a drawback to the United States and Latin America, and unfair to Europe.

The main body of the book concerns the life of the *seringuero* and *patrao*, calling attention to the imperative necessity for better sanitary conditions of living, and more honest methods of trading. The different kinds a discussion of the relative advantages and disadvantages of of foreign labour are described, and considerable space is devoted to the subject of internal transportation, to the Eastern and Western rubber industries, and to the possibilities before increased food production in Brazil.

The book will appeal strongly to those interested, as we are, in the West Indies, in the development of Brazil, and also to those directly concerned in the production or manufacture of rubber.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number describes the outstanding lines of agricultural work which are being followed at the present time in the smaller islands of the West Indies.

Two interesting reviews appear in this number: one of the recently issued report of the Agricultural Department, St. Vincent, and the other of a new book entitled The Rubber Industry of the Amazon and How Its Supremacy Can be Maintained.

The section entitled Down the Islands will be found on pages 2 and 3.

Insect Notes and Plant Diseases, respectively, deal with the Mediterranean fruit fly, and a stem disease of sugar-cane in Barbados.

New Invention in Rubber.

One of the few good features of the war has been its stimulating effect upon invention. In this respect Great Britain has not been the least to respond, in fact she has, in many ways, in spite of all the outcry against the unorganized state of science excelled the other Powers. The following is a little example, reported in the *India Rubber World*. The invention described is called a rubber shock absorber for the ears—a positive necessity for protection against damage to the ear drums from the air vibration of heavy gunfire. It looks like a stud and fits the oral aperture.

'The body of the defender is made of hard rubber, in a variety of sizes. Near the large end is a series of alternating discs of fine wire gauze, and a diaphragm of gold beaters' membrane. The latter stands free of contact, and is limited to the minutest motion by the gauze on either side of it. This instrument effectually protects the wearer's hearing by excluding violent concusions of air, and at the same time permits him to hear ordinary conversations. An ebonite tool for cleaning the open end of the defender accompanies each pair of instruments securely packed in a pocket case, in which they are held in place by rubber studs.'

The Barbados Annual Exhibition.

Much interest, as usual, was shown in the Barbados agricultural and industrial exhibition, which was held at Queen's Park on December 15 last. As would be expected in an old established colony, the show was more or less a replica of former years, but in certain respects there were features deserving of special comment.

In accordance with general expectation, the show of canes, yams, etc., was very creditable, surpassing that of the previous year, both in the number and quality of the items exhibited. Particularly numerous were the canes and yams, which included some of the best ever seen at an Exhibition. This high standard of quality with regard to agricultural products was undoubtedly due to the very copious rains we have had within the past few months. Not only were these rains copious, but they were most opportune, falling as they did at a time when they were calculated to bestow the greatest benefit upon the crops.

The first prize of $5 for a clump of plant canes taken from a single hole and from a field of canes was awarded to Mr. G. C. Mahon, of Highland plantation, St. Thomas. The variety was B.6450 and there were over thirty canes to the stool.

As regards live-stock, the show of young animals was distinctly good. Amongst the milch animals the Holstein and Jersey breeds were in prominence, and the growing dairy industry of Barbados was unmistakably reflected in this section of the show.

Altogether, including the commercial side, the show was a great success, and the number of attendances is believed to have been above the average.

German and Portuguese Cacao.

The trade of Samoa (formerly German) and that of San Thomé, a Portuguese possession, is reviewed in *Diplomatic and Consular Reports* for the years 1913 and 1914, respectively. Both these places are renowned for their cacao, and in this respect, are of interest from a West Indian point of view. Those who have studied the matter are of opinion that cacao planting in Samoa is a good investment, and that it is preferable to rubber, and equal, if not superior, to coco-nut planting. It appears, however, that cacao planting in Samoa is greatly affected by the presence of canker disease.

The exports of cacao and coffee from the Portuguese colony of San Thomé showed a considerable reduction during 1914, but the most interesting fact concerning the main products of these islands is that there are heavy protective export duties, which render prohibitive the export of these products to foreign countries in foreign vessels All the cacao and coffee produced on the island is carried to Lisbon in Portuguese ships.

Revolution and Distress.

Two Central American Republics of great natural wealth are Nicaragua and the Dominican Republic, and are described in *Diplomatic and Consular Reports*, Nos. 5477 and 5427. These places have, however, been the scenes of recent revolutions of unusual intensity, which have enormously interfered with their commercial prosperity. In regard to the Dominican Republic, it is satisfactory to record that in December of 1914, a permanent Government was elected, which gives rise to the hope that this country is about to enjoy a long period of peace. It is evident, however, that the revolutions of recent years have not inflicted any permanent damage on the productive industries of the country, and a steady increase of exports may be expected as communications gradually improve. It is interesting to note that 80 per cent. of the exports from this country are credited in the statistics to the United States. This is somewhat misleading, the fact being that the greater part of the sugar and cacao finds its way, via New York, to the United Kingdom and Canada.

The unstable conditions of the last three years in Nicaragua have left that country in an exhausted state, and business is at a standstill. An excessive amount of paper money has been thrown on the market without any reserve, though an attempt is now being made to reform the monetary system on a gold basis. Coffee is by far the most important article exported, the greater part being shipped to Havre, and a small quantity to the United Kingdom. The cultivation of bananas is controlled by an American Company, presumably the United Fruit Company; and the number of coco-nut plantations on the Atlantic Coast is rapidly extending. As in the case of the Dominican Republic, if the political situation could be rendered stable, this country has great natural resources, which would make it, for its size, one of the wealthiest Republics of Central America.

Trade and Commerce of Hawaii in 1913-14.

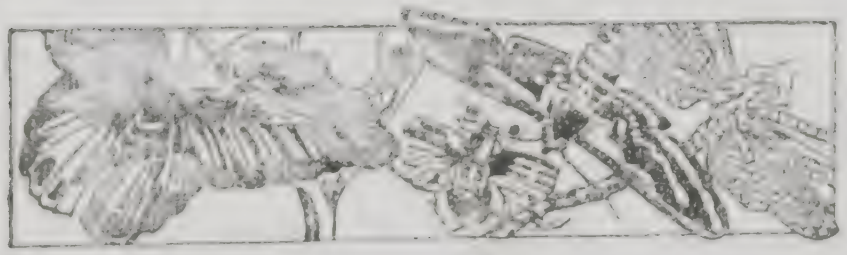
In *Diplomatic and Consular Reports*—No. 5459 Annual Series, there is presented the Report for the year 1913-14 on the trade and commerce of the Territory of Hawaii. From this the following information is gleaned. The trade proved less satisfactory than during the previous year, the total imports falling by £93,276, and exports by £317,193 The cause of the fall was due to over-production in the two principal articles of production—sugar and pine-apples. Though the total value of the sugar exported fell from £7,621,078 in 1913 to £6,844,312 in 1914, the quantity increased by 12,699 tons. There was a record crop of 617,038 tons, an increase of 177,000 tons during the past seven years. The normal Hawaiian sugar crop may be taken now at between 550,000 and 600 000 tons. One factor which contributed to the increased production on the mechanical side is the changes in mill grooving and mill setting that have been effected. Although there are no figures available, yet it is known that nine-roller mills, heretofore rendering an extraction of 93·5 per cent., have improved their efficiency as much as 3 per cent., and an appreciable gain is said to have been made in every mill where the Maesschaert grooving has been adopted.

As regards pine-apples, of the total exports of fruits and nuts, valued at £1,045,615, £986,306 worth went to the United States, and of this amount £959,312 represented the value of shipments of pine-apples. The great strides made in this industry are shown by the advance of the number of cases canned during the past twelve years, the figures being 2,000 in 1901 and 1,600,000 cases in 1913. There are now some 12,300 acres planted with pine-apples, and the yield runs from 10 to 18 tons per acre. At present the increase has been too sudden and great, with the result that prices are hardly remunerative to the grower; but local conditions are said to be so favourable to the product that the industry requires only more extended markets to assure a steady growth. A new factory has been erected close to Honolulu with a daily capacity of 250,000 cans, and a yearly output of 550,000 cases.

Exports of coffee also show an increase of 2,578,352 lb. in quantity, and £68,378 in value.

The Domestic Value of the Kapok Tree.

At a recent meeting of the British Guiana Board of Agriculture, Professor Harrison made some remarks concerning the kapok tree in that colony. He said that seed had been planted in the garden and the resulting plants had attained a height of 15 feet in eighteen months, at which age they flowered for the first time. Seeds had been got from them to the number of 1,000, from which 250 plants had been obtained. There were now 200 plants on hand waiting for applicants. His Excellency the Governor suggested that it would be a good thing if the peasants planted a kapok tree in their gardens, since the fibre formed the best material for stuffing pillows and matresses. In Southern Asia it is a usual thing for the peasantry to employ the fibres of this plant for such domestic purposes.



INSECT NOTES.

THE MEDITERRANEAN FRUIT FLY IN BERMUDA.

The United States Department of Agriculture has issued a Circular (No. 161) under the heading given above. This is an interesting account of the conditions relating to the Fruit Fly in Bermuda, given by Dr. E. A. Back, as a result of his investigation during a visit to that island in December 1913.

The occurrence of this insect in Bermuda and the measures adopted have been referred to in previous numbers of this Journal. It appears from Circular 161, as will be seen from the 'Conclusion' which is reproduced below, that there is no longer a fruit industry of Bermuda, and this is so, in spite of conditions which make eradication of the pest a not very difficult affair.

Interest in the Mediterranean fruit fly in Bermuda to residents in the Lesser Antilles lies in the danger of this insect being introduced from Bermuda to these islands. This chance is not great since there is no importation of fruit liable to be infested from Bermuda, but there is always the danger that plant products may be collected as curiosities by tourists while in Bermuda, and brought ashore, say, in St. Kitts, when the steamer is in that port.

It should be borne in mind that the introduction of the Mediterranean fruit fly would in time result in a very considerable reduction in the amount of locally produced fruit, and any maggoty or worm-infested fruits should be regarded with suspicion, and steps taken to get an identification of the insect concerned.

The following is a list of the plants which were found to furnish food and breeding opportunities for the fruit fly in Bermuda:—

LIST OF FOOD PLANTS OF FRUIT FLY IN BERMUDA.

Apple	Kamani (winged)
Avocado	Loquats
Citrus	Mango
Coffee	Papaya
Eugenia	Peach
Guava	Sapodilla
Kamani (ball)	Thevetia

CONCLUSION (CIRCULAR NO. 1).

'The Mediterranean fruit fly, *Ceratitis capitata*, Wied., was introduced into the Bermuda Islands probably about 1865, when fruit supposedly infested by this pest was unloaded there from a storm-tossed vessel from the Mediterranean region. Since that time the fruit fly has spread over the entire 19½ square miles of rolling country of which these islands are composed, and long since has ruined the excellent peach industry enjoyed by Bermuda in the early days, and has caused such discouragement among prospective fruit growers that at the present time native-grown fruit in Bermuda is a luxury.

'While Bermuda is probably at present a source of comparatively little danger to the United States as a source of infestation by the Mediterranean fruit fly, both on account of her trade relations and the climatic conditions surrounding New York, the extermination of the pest in these islands will be decidedly to the advantage of both Bermuda and the United States. The topography is cut up by harbours, lakes, and roads into small areas that can be easily inspected; the trees and shrubs, the fruits of which are subject to infestation, are surprisingly few numerically, and a large portion of the uncultivated lands supports little that is subject to attack.

'Experience in all countries where clean cultural work has been undertaken, but especially in the city of Honolulu, has shown that no lasting beneficial results will follow such work as has been carried on in Bermuda unless extermination is the object in view. The value of the fruit grown in Bermuda is not sufficient to warrant work being carried on with any other object. In no country where the fly now exists could work of extermination be undertaken with such assurances of success as in Bermuda. If clean cultural work were supported continuously by adequate legislation and undertaken by a person sufficiently conversant with the problem and eager to make a unique record in the entomological world, the Mediterranean fruit fly could be exterminated from Bermuda within three years, without the expenditure of a prohibitive amount of money.'

H.A.B.

THE DIRECTOR OF THE IMPERIAL BUREAU OF ENTOMOLOGY.

Reference has been made on several occasions in the columns of the *Agricultural News* to the Imperial Bureau of Entomology, which began operations as the Entomological Research Committee.

Under the able direction of Mr. Guy A. K. Marshall this organization has made growth and accomplished a great amount of good work. It may interest readers of this Journal to know that (according to *Nature*, October 28, 1915) the University of Oxford has conferred on Mr. Marshall the honorary degree of D.Sc.

The Public Orator in presenting Mr. Marshall, spoke of the great services rendered by him to scientific entomology during his residence in South Africa, mentioning in special his work on Coleoptera and Lepidoptera. He also referred in appreciative terms to the valuable researches being carried on under Mr. Marshall's direction in the recently established Imperial Bureau of Entomology.

With further reference to the note which appeared in this Journal for December 4, on the subject of introducing the Jack Spaniard into St. Lucia and Grenada, it is interesting to state that in St. Lucia the hatching out of the imported specimens has been completed, and 1,548 wasps have been liberated. In Grenada the combs forwarded from St. Vincent have been safely received, and it is expected that in due course these will also hatch out satisfactorily. As mentioned in the previous note, the few wasps which had at that time started work in St. Lucia appeared to be remarkably energetic in regard to their chief economic function, the control of the cotton and corn worms, and it looks as if these introductions, brought about through the initiative of the Commissioner of Agriculture, will confer great benefit upon the two islands concerned.

AN ADDRESS TO ST. VINCENT.

A fairly large number of local men interested in agriculture, including also prominent officials, responding to the invitation issued by the Agricultural Superintendent, had the pleasure of listening to a very able and comprehensive address by Dr. Watts on Wednesday last at the Court House. The meeting was opened by His Honour the Administrator, who having another engagement asked to be excused for leaving before its close, but he delegated the Hon'ble Vincent Prior to move the vote of thanks to the Imperial Commissioner at the termination of his discourse.

Dr. Watts having visited different districts since his arrival and gained first hand information regarding the condition of the several cultivations, his expert opinion is of first class value, and those who did not avail themselves of the opportunity of hearing his address, which was characterized by a frank, friendly and encouraging exposition of his views, have lost a privilege.

The Commissioner's discourse embodied a lecture on cotton, particularly concerning the position of the industry in this island. He advised planters to avoid the risk of too early planting, a practice in which they have been unfavourably caught this year. He urged the undesirability of changing seed; and suggested that they follow the advice of the expert, Mr. Lawrence Balls, whose book on cotton growing he recommended for their earnest study, emphasizing the advisability of devoting special attention to raising regularized types and maintaining purity of strain. Importation of foreign seed is unnecessary, as we are growing here a type with length and strength of fibre demanded by those spinners who require a Superfine Cotton. He also gave a warning against the possibility of importing the boll weevil, which would be most difficult to eradicate if we got it well established in one of these islands, for even as much as 30 miles of sea afford no impassable barrier to its spread.

With reference to the operation of the Central Oil Factory, he referred to its utility as producing the cotton seed meal which is of great value as a fertilizer, besides useful for feeding stock.

The Commissioner spoke briefly on the arrowroot situation, which needs only an observance of the law of supply and demand.

He considered that the arrowroot situation will be ameliorated, if the hopes confidently entertained for the development of a third staple industry be fulfilled. He alluded to coco-nuts. In his travels through the country he was very pleased at finding thousands of growing coco-nut trees in well established plantations coming on extremely well in various parts of the island. In one district there were 1,000 acres of growing coco-nuts, giving fair promise of a remunerative industry in the next few years. His advice to the growers however was, 'Don't treat the coco-nuts meanly'; and as there were pests which should be kept under control, he advised planters to keep in touch with Mr. Sands whose advice would prove useful to them.

As a rotation crop he dwelt on the advantage of corn, and advised that a properly cultivated area be given a fair trial, the Government machinery being at the public's disposal for kiln drying for export, in case the production became in excess of local demand.

Although mixed crops were generally condemned he considered that by reason of the fertilizing value of peas, the cultivation of corn and peas together deserved a trial; and he recommended the broad bean (known in Antigua as the Barbuda bean) as the best variety, fetching as it does the highest price in the market.

With respect to sugar, the Commissioner could make no announcement touching the probability of the Government being induced to promote the erection of a central factory for the revival of that industry here. In fact, conditions owing to the war would greatly hamper the importation of sugar machinery from England now, even if the owners of land desired to combine for the establishment of a factory here. In any case, he urged, it was a matter in which the people and not the Government had to make the first step, and having assured the production of sufficient cane for a factory, then approach the Government for a subsidy. He referred to the practical illustration offered by the Antigua Sugar Factory, the value of which now stands at £120,000. Sugar it surely bringing a fair price, and would so long as the war lasts; but there was, he said, no certainty as to the future of the industry. There were countries in the Empire with unlimited possibilities for sugar production, and he mentioned, for example, Natal alone, whose sugar output to-day is more than that of the whole of the West Indies and British Guiana. He advised the expansion of sugar-cane cultivation, the patching up of our old sugar works as efficiently as possible, and the manufacture of Muscovado, for which there is a considerable local demand, as well as a ready market elsewhere.

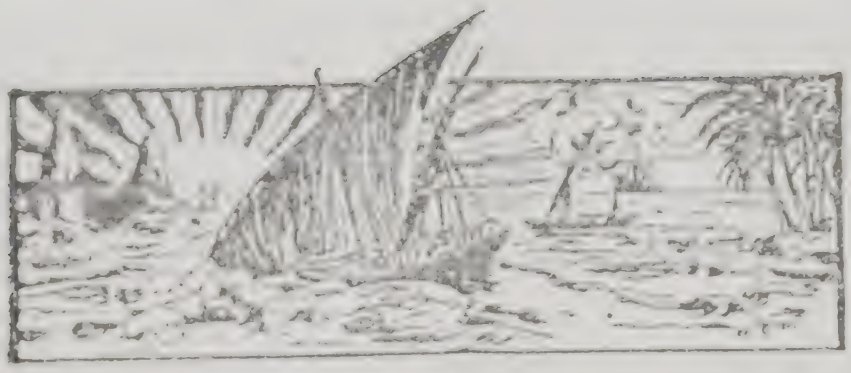
In conclusion, Dr. Watts made some remarks relating to the domestic position of the colony generally. He did not agree with those who are wearing long faces, for from his observations from an agricultural standpoint, he could find but little cause for complaint, and none for any alarm. The economic situation in St. Vincent in particular, and in the West Indies generally is, he said, very much better than it is in England, and we practically have no hardship to bear. Foodstuffs are plentiful, and although imports may show a decline affecting the Treasury, the people are being fed as they were before. Agriculture is in a flourishing condition and he could see nothing to make him feel that the prospects are gloomy. Whatever might be the commercial inconveniencies, we ought to consider ourselves fortunate that things are not worse. He felt sure that in about a year's time St. Vincent will have passed through a critical period and entered again in the march of progress. (St. Vincent *Sentry* for December 10, 1915.)

DEPARTMENT NEWS

Mr. W. R. Dunlop, the Scientific Assistant, left Barbados by the S. S. 'Albanian', on December 28, 1915, for Trinidad, on two weeks leave of absence.

Mr. H. A. Ballou, Entomologist, and Mr. W. Nowell, Mycologist, left for St. Vincent in the C.R.M.S. 'Chaudière' on December 29, to make investigations concerning the occurrence of thrips on cacao in that colony, and also to make general enquiries concerning plant pests and diseases there.

On their return journey it is expected that they may spend two or three days in Grenada, arriving at Barbados by the C.R.M.S. 'Caraquet' on the 13th. instant.



GLEANINGS.

The export of rice from Siam in 1913-14 was the largest on record, the figures being 1,173,980 tons, valued at £7,568,954. This exceeded the export of the previous record year, 1910-11, by 127,054 tons, and £608,962.

We regret to announce that Mr. J. L. Fonda, Treasurer of the Florida Manufacturing Co., Madison, Florida, who visited the West Indies on one or two occasions in connexion with the Cotton Industry, died on October 25, 1915.

The estimated population of Jamaica up to March 31, 1915, is given in a *Supplement to the Jamaica Gazette*, as 883,158. The number of new arrivals during the year was 15,218, and the number of departures, 12,330.

We see from the Uganda *Official Gazette* that the Agriculture Department distributes certain planting material at the following rates: Para Rubber seeds, 10*s.* per 1,000; Para Rubber plants, 30*s.* per 1,000; Cacao seeds, 15*s.* per 1,000; Clove seedlings, 50c. each.

According to Dr. Prinsen Geerligs in the *Louisiana Planter* for October 23, the reports from Java remain bad; the tonnage of cane per acre is low and the quality of juice is not good. It is added that in some favoured districts 6 short tons of sugar per acre is produced, but in a majority of places the yield will be below that.

The exports of cacao and spices from Grenada in 1914 were worth £280,308 and £21,165, respectively. These values were considerably below those for 1913 owing to unfavourable weather conditions in the latter year. The lime industry as well as coco-nut is extending. (*Colonial Reports—Annual*, No. 852.)

It is stated in the Report on the Agricultural Department of the Gold Coast for 1914, that experiments have been conducted at Aburi in the fermentation and preparation of cacao, and a better product appears to be obtained if the process of both fermentation and drying is not unduly hurried. An aggregate of six days in the sweating boxes appears to be ample.

The section concerning vegetable physiology and agriculture in the *Journal of the Chemical Society*, Vols. 107 and 108, contains the following abstracts of interest to scientific workers in the West Indies: the ferments of rum; the osazone method of locating sugars in plant tissues; the constituents of *Gloriosa superba*; and the biochemistry of sun woods.

An interesting table appears in the Annual Report of the Department of Agriculture, Uganda Protectorate, for the year ended March 31, 1915, showing the amount of starch contained in the roots of cassava, Ceara rubber, and sweet potatoes. Thirty pounds of cassava root gave 5½lb. of starch; 4lb. of Ceara gave 1½lb. starch; 30lb. of sweet potatoes gave 2lb. of starch.

The Swiss Chocolate Industry is the title of an interesting article in the *West India Committee Circular* for November 16, 1915. It appears that this industry has been a very successful co-operative movement. Swiss chocolate is composed of the following ingredients: cacao beans, 700; sugar, 1½lb.; cinnamon, 7oz.; grains of pimento, 14; cloves, 2oz.; pieces of vanilla, 3; or aniseed, 7oz.

We learn with great regret, the news of the death of Mr. John Musgrave, of Dominica. Mr. Musgrave was a well-known and respected planter. The event is particularly sad, in view of the fact that Mr. Musgrave had previously to his death succeeded in developing the property he owned by dint of hard work up to a point when to all appearance it should have been quite remunerative with only general supervision.

It is stated in *Diplomatic and Consular Reports*, No. 5456, dealing with the trade of Surinam for 1913, that sugar-cane was grown during that period on some six estates. Bourbon was the principal variety cultivated, and the land under this cane was pronounced by qualified opinion to be of considerably higher fertility than the general run of sugar-cane land in British Guiana. The amount of sugar exported was 10,708 tons in 1913 as against 9,029 tons in 1912.

Published in the St. Lucia *Gazette Extraordinary* for October 19, is an Ordinance to authorize the raising of money for the construction and improvement of roads and bridges by the issue of Government Debentures. All moneys raised on loan under this Ordinance will bear interest at the rate of 5 per cent. Provision is made to make the loan £20,000, and for the redemption of debentures and other matters. This Act is important from the point of view of the agricultural development of St. Lucia.

The Goulds Manufacturing Company has furnished this Office with their new general catalogue of pumps and hydraulic machinery. This is well illustrated, and shows pumps designed for every purpose including the latest windmill pumps, and various designs for spraying purposes. The two classes just referred to should be of special interest in the West Indies. A special type calling for mention is the Goulds Field Crop Sprayer which is designed for the purpose of dealing with large areas of crops like corn and cotton.

In a previous issue of the *Agricultural News* we dealt with a report by Mr. J. F. Clarenc on sugar manufacture in Louisiana. The Mauritius Department of Agriculture has recently forwarded us two further Bulletins, dealing in a similar manner with the manufacture of sugar in Java, and in Cuba and Porto Rico. These publications contain data of much interest for comparison between different factories working under different conditions. Certain sections in these Bulletins will be referred to at greater length in a future issue of this Journal.

PHYSIOLOGICAL EFFECTS ON HEVEA BRASILIENSIS PRODUCED BY TAPPING.

Bulletin No. 12 of the Department of Agriculture, Ceylon, dealt with descriptions of, and yields of rubber produced by, various systems of tapping carried out at the Experiment Station, Peradeniya, during 1911-13. The present Bulletin (No. 19) for July 1915, is to be regarded as complementary to Bulletin No. 12, and contains the results of the examination of the trees with regard to the relative quantities of reserve food stored in the bark and wood in, and at various distances from, the tapped areas.

The tapping systems employed are divided into three classes in accordance with the arrangement of Bulletin No. 12, viz.: (1) tapping on one-third circumference; (2) tapping on alternate days *versus* daily tapping on alternate months; (3) pricking methods.

With regard to (1), the experiments were carried out between July 1912 and December 1913 as follows.

78 A—Four cuts one foot apart to the left of the channel. Tapping extended over one-third of the tree's circumference and was carried out twice per week. 78 B—Four cuts one foot apart to the left of the channel. Tapping extended over one-third of the tree's circumference and was carried out once per week. 81 A—Two cuts one foot apart to the left of the channel. Tapping extended over one-third of the tree's circumference and took place three times per week. 81 B—Two cuts two feet apart on one-third of the tree's circumference. Tapping took place three times per week. 81 C—One cut at three feet from the ground. The tree was tapped on one-third the circumference six times per week. 82 B – Three cuts one foot apart to the right of the channel and one-third of the tree's circumference. The tree was tapped three times per week. The results are summarized as follows:—

78 A and 78 B. 'In one case the tree had been tapped twice a week, and the whole of the bark between the top and bottom cuts had finally been excised. In the other case tapping had taken place only once a week, and untapped bridges of bark, $5\frac{1}{2}$ to 6 inches broad, remained between the tapped areas.

'In the former case the effect of tapping on the storage of food supplies was very strongly marked, and was apparent in the region below the lowest tapping cut right down to the roots. It was also apparent horizontally, 1 inch to the side of the lowest tapped area.

'In the case of the tree which had been tapped only once per week, the effects were only local and did not extend to a distance of 3 inches measured vertically below the cut. No effects were detected in the roots. It is thus apparent that the widespread effects observed in the former case were due to a large number of cuts being continued until each tapped area adjoined the next. There is evidence of a small withdrawal of starch from the bark and wood for a short distance vertically below a single cut. Where there are four cuts, each of the upper three being continued down to the area originally tapped by the cut beneath it, the effect of each on the food storage is apparently felt by the tapping cut below it, the effect of which in its turn is thus magnified. The effect is thus cumulative, and below the lowest cut a very considerable effect is observable.'

81 A. 'The effects of tapping on the food supplies of the tree were absolutely localized. No effect was observable 2 inches vertically below, or 1 inch horizontally to the side of, the tapped area.'

81 B. 'In this case again the effects of tapping on the food storage of the tree were apparently absolutely localized. No effect was observable at short distances to the side of, or vertically below, the tapped areas. Half-way down the tapped areas the bark was commencing again to store up starch, and the wood behind this bark was also recovering its starch content.'

81 C. 'The bark at distances of $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of the length of the tapped area, measured vertically down from the top, showed that the bark contained traces of starch only, but that the wood behind had nearly recovered its normal starch-content. The regions in the immediate neighbourhood of the tapped area, both to the side of and vertically below it, showed no depletion of starch-content, and were similar in condition to sections of the trees taken above the tapped area. The effect of tapping in this respect was, therefore, absolutely localized.

The results in regard to 82 B. are thus summarized:—

'There were definite indications that the regions below the tapped area had suffered some small withdrawal of starch from the outer zones of the wood, though the effects were not so pronounced as in the case of 78 A, in which there were four cuts and tapping was to the left.

'The untapped regions to the side of that vertically below the most recently tapped area also showed evidence of starch depletion in the wood, though this might have been due to the effects of previous tapping in the regions directly above rather than to the obliquely directed effects of the most recent tapping. This, however, would seem to be improbable, as the lack of starch in the sections of wood in question is greater than that in the wood behind the old tapped bark directly above. Some effect, therefore, had in all probability been produced in large portions of the tree below the most recently tapped portion.'

The experiments in regard to tapping on alternate days, and pricking methods, with the summary of results and final conclusions drawn therefrom, will be given in the next issue of the *Agricultural News*.

Grenada Land Settlements.—The monthly report by the Agricultural Instructor for October 1915 has been forwarded from Grenada to this Office by the Governor. In this report mention is made, amongst other matters, of the progress attained in connexion with the experimental plots. Rounceval peas have been raised for seed distribution, and the limes and horse beans at St. Cyr Mountain Settlement are making very satisfactory growth. The beans, which were planted on August 20, were flowering at the end of October. As regards crops on the settlements, it is stated that cacao pickings came in with a rush during the month. Prospects seem to indicate satisfactory pickings to December 31. It is also observed that grape fruit and oranges were coming to maturity rapidly during the month. As regards the general condition of the holdings, it is reported that there is need for better drainage, and that this is being given attention in many instances.

PLANT DISEASES.

A STEM DISEASE OF SUGAR-CANE IN BARBADOS.

At a recent meeting of the Barbados Agricultural Society, according to a report in the *Barbados Advocate* of December 22 last, Mr. J. R. Bovell, Superintendent of Agriculture, made a statement as to the existence in Barbados at the present time, of a disease of sugar-cane similar to or identical with that occurring in India, described by E. J. Butler and Abdul Hafiz Khan (*Memoirs of the Department of Agriculture in India*, Botanical Series, Vol. VI, pp. 181-90) under the name of wilt, and shown to be due to a fungus to which the name *Cephalosporium sacchari* was given by the first-named author.

A review of the paper containing this description was given in the *Agricultural News*, Vol. XIII, p.62, and it was there mentioned that a Cephalosporium has been met with in the West Indies on pieces cut with the usual precautions from the interior of diseased canes. This referred to observations by the present writer on Barbados material, so that the occurrence now recorded cannot be regarded as new. Evidence of the pathogenic nature of the fungus is equally lacking from both West Indian records, but the general resemblance of the disease to that described by Butler and Khan, and the absence of other fungi from a considerable number of diseased canes examined, afford some grounds for the presumption that the Cephalosporium is its cause.

In view of the possibility of the occurrence of the affection in those islands in which the Imperial Department of Agriculture is directly interested, the writer took advantage of an opportunity of examining early in November, an estate on which the disease was reported to have appeared to a considerable extent. It was found that the affection was generally distributed, but not abundant, throughout several fields of the variety B. 6450. Adjacent fields of White Transparent and B. 376 were examined and appeared to be quite healthy; but according to Mr. Bovell's announcement, the disease has been found to occur, to an extent not stated, on these varieties also.

The opinion formed by the writer was that the disease at that time was entirely, or almost entirely, confined to canes whose water-supply had been interfered with, most often as a result of wrenching by high winds, and in other cases by the development of *Marasmius sacchari* in the cane base. A second visit some weeks later did not reveal much apparent extension of the affection, but the amount of the damage cannot be properly estimated until the canes are reaped.

The external symptoms of the disease are similar to those of the red rot once familiar in the West Indies on the Bourbon cane. The internodes affected are usually near the base; the surface first shows a reddish-brown patch, and eventually a sunken spot is formed which later becomes infested with secondary fungi, notably *Melanconium sacchari*. On splitting the cane some form of reddish discoloration is seen; this may be somewhat superficial, or may extend through the centre of the cane. The fully developed colour is a muddy blackish-red.

No notable wilting of canes as described by Butler and Khan has so far been observed.

The threatening appearance of the Barbados outbreak led to a request for observations in St. Kitts and Antigua being addressed from this Office to the agricultural officers concerned. Since writing the above paragraphs an examination has been made of material received from Mr. F. R. Shepherd in St. Kitts. The specimens are of White Transparent cane, and are accompanied by the information that they are from a district in which that variety has previously proved very susceptible to fungoid diseases, and for that reason is seldom planted. The field from which they were obtained was about nine months old, and the canes were drying up in a manner typical of a fungus attack. Canes of other varieties were remarkably healthy.

The appearance of the canes when split coincides exactly with that represented in Butler and Khan's coloured plate, namely, reddish longitudinal streaks following the course of the vascular bundles. The correspondence is much closer than in the case of the Barbados examples on B. 6450, examined by the writer.

Ten pieces were cut with suitable precautions from the interior of several of the canes received, and were placed in sterile tubes, and of these eight have developed a Cephalosporium form corresponding in appearance, and in the size and range of length of the conidia, with Butler and Khan's drawings and description. One of the remainder developed a culture of Thielaviopsis, which is present on the cut ends of most of the canes received; the fungus in the other has not as yet developed sufficiently for identification.

It seems probable that this fungus is widely distributed in the West Indies. Possibly it was an unrecognized factor in the complex known as rind disease which led to the abandonment of the Bourbon cane. Its apparent ability to produce a somewhat serious disease, in varieties resistant to the main factor in rind disease, the red rot due to *Colletotrichum falcatum*, gives it both practical and theoretical interest.

W. N.

Those who are interested in the question of fruit or vegetable grading may care to refer to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for January 1915, which contains an illustrated account of the Newton fruit-grading machine. It consists of a conveyor band passing over a pulley at each end which carries the fruit along a padded surface. On a spindle is a large pulley round which passes a leather belt that drives the grading rollers at varying height above the conveyor band. The grading rollers are covered with felt and have spirals on them for correctly grading the fruit. The first grading roller, being the highest above the band, deflects the largest fruit on to the first table, and permits the smaller fruit to pass underneath to be similarly dealt with by the succeeding rollers. The machine with the table folded, measures 2 feet by 6½ feet, and weighs 140lb. Its price is £15, and its rated capacity is 15 cwt. of fruit per hour.

SOIL ANALYSIS BY PLANTATION MANAGERS.

In a recent issue we had pleasure in reproducing a Leaflet on the value of soil analysis, issued by the English Board of Agriculture. This showed that it is very difficult to draw deductions from single soil analyses that will be of value in practice. This circumstance makes a recent article in *Tropical Life*, which describes how the plantation manager may analyse his own soil, particularly opportune. The method described consists in the carrying out of a number of pot experiments with the object of finding out from the individual plant the sort of nutriment it requires in relation to a particular soil. To execute this work one needs only a few flower pots such as can be made by native potters, or bamboo pots, galvanized iron pails or kerosene tins with a hole in the bottom, or flat boxes (as referred to in a recent article in the *Agricultural News*). Each receptacle will hold say from 15 to 30 lb. of soil, and with this is mixed in each case, respectively, the fertilizer or combination of fertilizers that it is desired to experiment with. In the article in *Tropical Life* a special point is made of the desirability of mixing some of the subsoil with the surface soil when filling the pots. For it is fairly safe to assume that the roots get most of their food in the upper 3 feet of ground; and so, if, for instance, the dark surface soil is about 6 inches deep, the mixture should be made with one-sixth of surface soil and five-sixths of subsoil.

Every planter is familiar with the chief chemical constituents needed by the plant in the soil, and with the various artificial manures that are capable of supplying these in an available form. But in these experiments not commercial manures but more or less pure chemical salts corresponding to them are used instead, and, of course, in very small quantities. It is urged that importers of artificial manures should keep some of these pure salts in stock in order to promote the pot culture experiments, as they are, without any doubt, the best form of propaganda in favour of chemical manures.

When the pots have been filled and the manures added, they are then given a thorough soaking with rain-water, taking care, however, not to apply too much. The water in the pots should then be renewed every week for about a month, so that the comparatively heavy doses of manure may combine with the soil and not injure the plants. We then proceed to the planting, and for this a short variety of maize is a suitable plant, though it is most interesting to plant several series of crops of widely differing species. After the plants are a few inches high, the necessary thinning is effected, and the pots are placed in the open and tended in such a manner as to ensure that any differences in their growth shall be derived only from differences in manurial treatment.

Accompanying the article referred to above, appear illustrations of sets of pots which clearly show the great range of influence exerted by the application of fertilizers in the manner of these trials. Out of fifteen different combinations of salts containing, respectively, nitrogen, phosphate and calcium, eleven proved ineffective or nearly so, as they scarcely gave a better crop than when no manure was applied. The photograph shows clearly also why many trials of artificial fertilizers in the tropics are unsuccessful; it is because one does not apply the particular *combination* required by each kind of soil. Some soils want phosphate, some lime, while some want both phosphate *and* potash.

These pot culture analyses are, it will be seen, simple and cheap, and the results are often very striking. It should be well understood, however, that the pot culture trials cannot show what *quantity* of manure is required per acre, but only the *kind* of manure that should be used in the soil under trial. If the pot culture trials show, for instance, that a soil needs nitrogen and phosphoric acid, we shall have to go one step further and start experiments in the field so as to make sure that the manure is right, and to ascertain how much of each manure should be used. This can only be shown by actual field crops growing under the usual weather conditions of the country.

The following table is reproduced from the article under consideration, to show the different combinations of salts used in the series of experiments referred to. It is to be understood that each pot contains 15 lb. of soil. Where larger quantities are employed, the amount of chemicals must be correspondingly increased:—

Pot No.		Grains.
1	No manure.	
2	Nitrogen only — —	Ammonium nitrate — 75
3	Phosphoric acid only —	Sodium phosphate — 90
4	Potash only —	Potassium carbonate — 45
5	Lime only — — —	Calcium carbonate — 30
6	Nitrogen + phosphoric acid	Ammonium nitrate — 75 Sodium phosphate — 90
7	Nitrogen + potash —	Ammonium nitrate — 75 Potassium carbonate — 45
8	Nitrogen + lime — —	Ammonium nitrate — 75 Calcium carbonate — 30
9	Phosphoric acid + potash —	Sodium phosphate — 90 Potassium carbonate — 45
10	Phosphoric acid + lime —	Sodium phosphate — 90 Calcium carbonate — 30
11	Potash + lime — —	Potassium carbonate — 45 Calcium carbonate — 30
12	Nitrogen + phosphoric acid + potash — — —	Ammonium nitrate — 75 Sodium phosphate — 90 Potassium carbonate — 45
13	Nitrogen + phosphoric acid + lime — — —	Ammonium nitrate — 75 Sodium phosphate — 90 Calcium carbonate — 30
14	Nitrogen + potash + lime	Ammonium nitrate — 75 Potassium carbonate — 45 Calcium carbonate — 30
15	Phosphoric acid + potash + lime — — —	Sodium phosphate — 90 Potassium carbonate — 45 Calcium carbonate — 30
16	Nitrogen + phosphoric acid + potash + lime —	Ammonium nitrate — 75 Sodium phosphate — 90 Potassium carbonate — 45 Calcium carbonate — 30

The Administrator of St. Lucia has forwarded for the information of this Office copies of the notice recently issued in St. Lucia under the authority of the Contagious Diseases (Animals) Ordinance, 1906, Amendment Ordinance, 1908. This provides that no animals shall be imported until further notice from the islands of Antigua and Barbuda; and no animal arriving from any of the islands comprised in the Leeward Islands Colony shall be allowed to be landed unless it is accompanied by a certificate signed by the Comptroller of Customs that the animal has not come from, or been in, either Antigua or Barbuda within the previous six months. It may be added that this notice is due to the infectious disease of epizootic lymphangitis, which the St. Lucia Government is advised at present exists amongst stock in Antigua and Barbuda. From records at this Office it appears that no cases of epizootic diseases came under the notice of the late Veterinary Officer of this Department in St. Lucia. These are stated to occur in Grenada, Dominica and Antigua.

MARKET REPORTS.

London.—The West India Committee Circular, November 16, 1915.

Arrowroot—2¼*d.* to 4¼*d.*
Balata—Sheet 2*s.* 4¼*d.*; block 1*s.* 10¾*d.* to 1*s.* 11*d.*
Beeswax—No quotations.
Cacao—Trinidad, 84/6 to 86/- per cwt.; Grenada, 87/6; Jamaica, 85/6 to 93/-.
Coffee—Jamaica, 51/- to 52/- per cwt.
Copra—£29 to £29 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to 28*d.*
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, 58/- to 80/-.
Isinglass—No quotations.
Honey—29/- to 39/- per cwt.
Lime Juice—Raw, 2/6; concentrated, £25; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £9.
Mace—6*d.* to 2/4*d.*
Nutmegs—4½*d.* to 8*d.*
Pimento—2½*d.*
Rubber—Para, fine hard, 2/8¼; fine soft, 2/6½; Castilloa, 2/4.
Rum—Jamaica, 4/4 to 5/3

New York.—Messrs. Gillespie Bros. & Co., November 17, 1915.

Cacao—Caracas, 20½c. to 21c.; Grenada, 19½c. to 20c.; Trinidad, 20¼c. to 20½c.; Jamaica, 18c. to 18½c.
Coco-nuts—Jamaica and Trinidad selects, $40·00 to $42·00; culls, $25·00 to $26·00.
Coffee—Jamaica, 8½c. to 12c. per lb.
Ginger—14½c. to 17c. per lb.
Goat Skins—Jamaica, 45c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
Grape Fruit—Jamaica, $2·75 to $4·00.
Limes—$4·50.
Mace—36c. to 44c. per lb.
Nutmegs—12c. to 12½c.
Oranges—Jamaica, $2·00 to $3·03.
Pimento—3¾c. to 4c. per lb.
Sugar—Centrifugals, 96°, 5·02c.; Muscovados, 89°, 4·40c.; Molasses, 89°, 4·24c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., November 29, 1915.

Cacao—Venezuelan, $17·50 to $18·00; Trinidad, $17·50 to $19·00.
Coco-nut Oil—87c. per Imperial gallon.
Coffee—Venezuelan, 14c. per lb.
Copra—$5·00 to per 100 lb.
Dhal—$6·25.
Onions—$4·00 to $4·50 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 lb.
Rice—Yellow, $6·10 to $6·25; White, $6·00 to $6·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October [illegible]; December [illegible] September 2, 1915.

Arrowroot—$4·50 to $4·60 per 100 lb.
Cacao—$15·00 to $16·00 per 100 lb.
Coco-nuts—$20·00 husked nuts.
Hay—$1·70 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $85·00 to $95·00 per ton.
Molasses—No quotations.
Onions—$7·00 to $10·00 per 100 lb.
Peas, Split—$10·00 to $12·50 per 210 lb.; Canada, $5·40 per 120 lb.
Potatoes—Nova Scotia, $4·87 to $5·00 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·60 to $4·25.

British Guiana.—Messrs. Wieting & Richter, November 13, 1915; Messrs. Sandbach, Parker & Co., November 26, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per lb.	21c. per lb.
Cassava—	$1·20	——
Cassava Starch—	$10 to $11	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian		10c. per lb.
Dhal—	$6·00	$7·50
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	7c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$4·00 to $4·25	$4·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·68	——
Rice—Ballam	No quotation	——
Creole	$5·25 to $5·50	$5·50
Tannias—	$2·64	——
Yams—White	$2·88	——
Buck	$3·12	——
Sugar—Dark crystals	$3·50 to $3·70	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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The War and Cotton Production.

GROWERS of cotton, in all parts of the Empire, will read with much interest the recent views of Professor Todd on the war and the world's cotton crops.* According to this anthority, the prospects of high prices for cotton are extremely favourable, and, rather than speak of reducing the acreage, we should agitate and make every effort for an extension. 'Every penny', says Professor Todd, 'that the British Empire invests now in cotton growing, either in education or engineering, will be a profitable investment in the future, and the sooner the investment is made, the greater, as well as the quicker, will be the return. What we shall want after the war is not merely a British Cotton Growing Association with a capital of a paltry £500,000, but an organization of the size of a State Department with all the combined resources of the British Empire behind it, and a capital of about as much as we are spending on this war in three days, say £10,000,000.'

The circumstances underlying these conclusions may be summarized. First of all, it must be pointed out that, according to Professor Todd, for five seasons out of ten before the war, the world's cotton consumption was actually in excess of the world's crops. Prices, therefore, have risen to a very high level, as is shown by the fact that the price of American Middling has risen from 3·76*d.* for the period 1894-95 to 1898-99, to 7·16*d.* for the period 1909-10 to 1913-14. During the season before the war the average price was 7·26*d.* After the outbreak of hostilities, with an American crop of 17,000,000 bales in view (the largest on record), prices fell steadily until in December, American Middling touched 4¼*d.*; but from that point a really marvellous recovery set in, which has now carried the price well above 6*d.*

The cause of this recovery was due to several things—to the country's getting a certain amount of new business at the expense of the enemy, to the briskness of the home demand, and to a new and special demand for gun-cotton.

But the downward rush of prices in the autumn of 1914 resulted in a serious curtailment of the world's acreage under cotton this year. General concensus of opinion places the reduction of acreage in America at 15 per cent.: allowing for similar reductions in other countries, it is likely that the world's supply

*Special article in the *Bulletin of the Imperial Institute*, Vol. XIII, No. 3.

in 1915-16, even with an unusually large balance carried forward from the 1914 crops, may not be enough to meet the demand. Of course, as Professor Todd points out, supply will always meet demand *at a price*, because a high price will reduce the demand to the dimensions of the supply. The question is whether the consumer's demand will be sufficient to enable Lancashire to pay the high prices which the Southern States will want to make them extend their acreage. The American cotton planter of to-day is in a very independent position as regards choice of crops, and what with high labour costs and boll weevil, he is not too anxious to grow cotton at 10 or 12 cents. It is difficult to forecast what the actual conditions of demand will be when the war is over, but it is very probable that what is lost in the demand for war materials will be more than made up by the rush to replace the exhausted stocks of all kinds of other fabrics, and that, for a time at least, the demand will be above rather than below the normal. But the longer the war lasts, the greater will be the reduction of acreage.

How this can be prevented, brings us back again to Professor Todd's conclusions quoted at the commencement of this article. Cotton growing must be stimulated at once within the Empire. The greatest possibilities, says Professor Todd, for immediate increases, lie in India, where great improvements both in quality and quantity have been made in recent years.* Help and encouragement must also be continued in Egypt, and East and West Africa.

In conclusion it may be of interest to consider Professor Todds' views in their bearing on West Indian or Sea Island cotton In volume our production is a negligible quantity, but we supply a very special market. After the outbreak of war, West Indian cotton growers, like the planters of the Southern States and Egypt, exhibited a strong inclination to reduce the acreage under cotton, especially in view of the increased demand for sugar and other foodstuffs. But the British Cotton Growing Association advised otherwise, and luckily this advice in most of the islands was largely followed. It is true that great delay in the effecting of sales has occurred, but, on the other hand, a review of the year's market for Sea Island cotton shows a steady strengthening of prices and of demand. During the first half of the year the demand no doubt was limited, but 14*d*. to 15*d*. for ordinary Sea Island cotton was obtained. Advices for the past three months indicate an extensive business in West Indian cotton, and this circumstance, stiffened by the guarantee of a minimum price by the Fine Spinners, shows that Sea Island cotton is still indispensable. If it were not for the inadequate freight facilities and heavy war rates—most important points which Professor Todd has not taken into consideration—the prospects before cotton growers throughout the world would seem to be extremely favourable.

*Information on this point may be obtained by reference to *The Agricultural Journal of India*, Vol. X, Part 2, (April 1915). Ed.

THE CONDITION OF THE AMERICAN SEA ISLAND COTTON INDUSTRY.

A paper, important to the West Indian cotton grower, has been issued as Bulletin No. 146 of the United States Department of Agriculture, in which is described the economic conditions in the Sea Island cotton industry of the United States. The paper is based upon the results of an investigation carried out on account of the condition of crisis that existed in Carolina and Georgia in 1912-13. In making the investigation care was taken to obtain information from both spinners in America and producers, for, underlying to a large extent the trouble with which the present paper deals, was the strained relationship between the growers and the buyers.

It appears that the general unsatisfactory condition of the American Sea Island trade has been due to under-consumption rather than to over-production. By this is meant that a large proportion of the crop is exported from the United States, and therefore, not used in the American mills. During recent years the importations of Egyptian cotton into the United States were practically uniform. In 1912-13, however, the consumption of Egyptian fine staple increased greatly, and it is concluded that not only the entire falling off in consumption of extra long staple, but the increase in consumption of Egyptian was at the expense of Sea Island cotton.

The causes of decreased consumption were several. The most important was the deadlock of 1912-13 when growers refused to sell at the price offered them by the buyers. The result was that the buyers turned to Egypt, and supplied their year's need at prices and on terms more satisfactory than those offered by the holders of Sea Island cotton. But aside from any hitch in the usual methods of buying and selling, Sea Island cotton was sooner or later bound to meet Egyptian in competition. This applies more especially to Sakellarides, of which the lint is not inferior in many respects to medium Sea Island. The publication under consideration mentions some of the reasons given by spinners for preferring Sakellarides to Sea Island: these may be stated briefly as follows: (a) it is manufactured with less waste; (b) it works better in the card room: (c) it makes stronger yarn and stronger cloth: (d) better buying terms: (e) the difficulty of changing back to Sea Island cotton when Sakellarides has found a use in any special line.

To continue our enumeration of the causes of decreased consumption of Sea Island cotton, another reason for the lessened use is that its quality in America is not so uniform and good as it was formerly. The most serious cause of deterioration in the interior regions has been the refusal of the Carolina growers to sell planting seed to others. This decision not to sell planting seed came about as the natural result of a situation in which the American planters found themselves. In 1902 the culture of Sea Island cotton was

introduced into the West Indies. Seed was bought from the best Carolina plantations, and some of the expert Carolina growers were engaged to teach the people of St. Vincent, Antigua, Barbados, and other islands how to raise and prepare this crop for market. The effort to grow the cotton in the West Indies was successful beyond expectations, and within five or six years the Carolina farmers commenced to feel the West Indian competition. They resolved to cease selling seed to any one—not only to the West Indies, Florida, and Georgia, but also to their fellow islanders. The consequence was that the general standard deteriorated, because the small grower was dependent on the large grower for good quality seed. Another calamity was the introduction of Upland cotton, which led to considerable cross fertilization between the short and long stapled varieties, and this occurred in the most favoured section of the Sea Island producing area.

Another cause for decreased consumption has been changes in fashion, together with enforced economy of production. An article which is essentially made to sell at a cheap rate cannot generally be expected to contain Sea Island cotton of good quality, and those manufacturers who are concerned in the production of a popular article generally supposed to contain Sea Island cotton, very seldom use that kind. Automobile tyre cloth forms a good example. Sakellarides and good quality Sea Island are still used in America to a limited extent in the manufacture of tyre fabrics, but the bulk of this product is from the lower grades of the long staples, especially Egyptian. This shifting of the tyre cloth trade largely to other cottons has almost closed the largest outlet for Sea Island consumption in America, and is a serious menace to the very existence of the Sea Island industry of that country. However, the final word has not yet been said in the tyre cloth business, and it is still possible that the wearing qualities of tyres constructed from low grades of cotton will prove unsatisfactory to their users, and that there will be a return to the old standard quality in tyres.

Turning now to another aspect of the subject, namely the conditions amongst producers, the publication under consideration gives some interesting information concerning the system of marketing. It appears that a very important middle man is the Factor, from whom the spinner buys, and to whom the grower sells. Indeed the Factor advances money and supplies to the farmers to enable them to make their crops, and collects the amounts when due. Perhaps one of the most notable of the labour conditions of the South Carolina market is the fact that a single firm of cotton buyers usually purchases over three-fourths of the Carolina crop. Four firms of Factors make practically all the advances towards raising the crop, and the firm of buyers and all four of the factors do their banking with the same institution. The cotton-buying firm is represented on the Directorate of the Bank. The potential power of a firm of cotton buyers in such a position is, of course, great.

Another detrimental condition that exists, arises from the excessive use of the hoe in the cultivation of American Sea Island, which is very expensive. Yet another unfavourable condition is that there are too many kinds of cotton. It is suggested that an attempt should be made to grow medium and uniform cotton. There can be no objection to a few planters growing the extra staple Sea Island cottons if they choose to do so, but it would not be advisable to increase the production of these extra staples under the present conditions.

If the prospects before Sea Island cotton in America are not bright, the farmers have little to worry about, because they can turn their attention to alternative crops which can easily be made as profitable as cotton. Finally, the prospects for a continuance of the industry in the Southern States is rendered very uncertain by the approach of the boll weevil. At the present rate of progress, it is stated that this pest will overrun the entire Sea Island area in from five to eight years. Those best posted concerning the nature and habits of this pest are agreed in saying that it may put an end to the profitable production of Sea Island cotton in America.

The special conditions attendant on the industry in Georgia and Florida are of interest. In most of Georgia, and in much of the Florida Sea Island area, Upland cotton grows well, and Upland is encroaching on Sea Island in every county in which both are being grown. Mention should be made of the good work of the ginning companies in these States, many of which have gone to considerable trouble in order to secure and distribute the best seed available for planting.

In conclusion, it is clear from the publication which has provided the preceding information, that not much hope is held out for long-continued existence of the Sea Island cotton industry in America. It would seem that in the near future, say, within the next five years, the British West Indies may hold a real monopoly, if Egypt can be excluded. It is important for West Indian cotton growers to keep up a high standard, and not to reduce the acreage. The information that has been afforded by this Bulletin greatly strengthens the position of the West Indian grower in relation to the spinners, as well as to his American competitor.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, the Scientific Assistant, returned to Barbados by the S.S. 'Vauban' from Trinidad on January 10, 1916, after spending twelve days in that Colony.

Mr. H. A. Ballou, M.Sc., Entomologist, and Mr. W. Nowell, D.I.C., Mycologist, on the Staff of the Imperial Department of Agriculture, returned to Barbados by the C.R.M.S. 'Caraquet' on January 11 from an official visit to St. Vincent, where attention was given to problems connected with plant pests and diseases. On their return voyage to Barbados a few hours were spent in Grenada.

The instruction given by local cacao instructors in the Gold Coast forms an important part of the work of the Agricultural Department of that Colony. This work has been extended to Ashanti during the past year, which is regarded as likely to bring about still greater progress in cacao cultivation in this part of Africa. It is said that this system calls for very frequent supervision, if the best results are to be achieved.

We are informed by Mr. R. Foster Parkinson, that the goat 'Albertha' (grade Toggenburg) was the winner of the first prize and diploma of merit in Class I offered by the Commissioner of Agriculture for milch goats at the Barbados Annual Exhibition on December 15, 1915. Mr. Parkinson points out that it may be of interest to know that this is the third year in succession that a goat sired by 'Jensen', the Buck imported by this Department, has won the first prize.

FRUIT.

THE AVOCADO IN CALIFORNIA.

'The Avocado in California' is the title of Bulletin No. 254 of the College of Agriculture, Agricultural Experiment Station, Berkeley, California, for May 1915. This deals with the culture, production and marketing; composition, and food value of the fruit. As to the possible market for these fruit, it is pointed out that avocados grown in California and shipped to Eastern or even to Middle Western markets will have to compete more or less with fruit from Florida and the West Indies, especially in the fall of the year. Whether this competition can be met with avocados as successfully as it is being met with citrus fruits remains to be seen. Even should it be found impracticable to pack and ship thin-skinned fruits to Eastern markets and have them arrive in condition to sell in competition with hard-shelled fruits from Florida, it is believed that such fruit should be in demand in the local markets for some years to come.

The requirements of a good commercial variety are briefly outlined as follows:—

1. The bud of such a variety should be able to grow into a vigorous, upright, orchard tree.
2. It should be sufficiently hardy to withstand ordinary frosts.
3. It should be precocious, prolific, and a regular bearer.
4. It should blossom late enough for the flowers to escape heavy spring frosts.
5. The fruits should be of good flavour and quality.
6. The size and shape of the fruit should be uniform and not too large, approaching oval or round, rather than 'bottle-necked', and averaging 1 lb. in weight.
7. The fruit should be well adapted to shipping.
8. The seed should be small and tight in the cavity.

Many of the thin-skinned avocados are superior so far as flavour is concerned, and are excellent fruits for home use and local markets. Seedlings and budded trees of such varieties as the Harman, Northrup, Chappelow, and Carton grow vigorously and develop into shapely orchard trees.

Touching its nutritive value, a survey of the data presented in the bulletin shows the avocado to differ widely in many respects from the average of fresh fruits, and proves it worthy of special consideration. It is of decided interest to note that the mineral matter in the avocado is much greater than that found in any fresh fruit. The discussion on this part of the subject clearly indicates that so far as protein and ash in fresh fruits are concerned, the avocado stands at the head of the list, and, with reference to the carbohydrates, contains, on an average, fully 50 per cent. of that found in many fresh fruits. These facts alone warrant due consideration being given to the value of the avocado as a fresh fruit.

Preserved Mangoes.—A new industry, the preservation of mangoes, has recently been started in Manila. Although the enterprise is at present on a small scale, it promises to develop to very considerable proportions. The Philippines is the home of the mango, and for years efforts have been made to prolong the use of the fruit and its excellent flavour, the season for the mango being comparatively short, and the delicate nature of the fruit preventing its retention for any length of time, or its export from the islands. It is stated that a satisfactory process of preserving the fruit in glass jars has been discovered. The preserved fruit is to be known as mango honey. (*Journal of the Royal Society of Arts*, for November 12, 1915.)

THE BERMUDA BULB AND TUBER TRADE

The cultivation of onions, potatoes, and lily bulbs for the United States markets still continues to be the chief agricultural industry of Bermuda. The principal market is New York. The exportation of kitchen garden produce, such as lettuce, beans, peas, parsley, celery, carrots, beets, etc., to New York in the early part of the year, is increasing gradually.

There is one arrowroot factory, which is equipped with modern plant, and is capable of producing a large quantity of this commodity.

Bermuda arrowroot apparently continues to hold its premier place in home and foreign markets. The price (retail) per lb. in London is about 2*s.* 6*d.*

A factory for the manufacture of cigars from imported tobacco was established in Hamilton in 1906, and now supplies the bulk of cigars locally consumed. This industry has caused a decline in the quantities of cigars imported, and a consequent loss of revenue. The value of cigars imported for 1914 as compared with 1905, was for 1905, £4,508, and for 1914, £2,528.

The potato crop for 1914 was large, and the average price received in the New York markets was fair.

The quantities exported were as follows: 41,125 barrels, of a declared value of £35,623. The quantity exported in 1913 was 52,675 barrels, of a declared value of £38,803.

The quantity and value of the onions exported during the last five years are shown in the following table:—

Year.	Quantity, crates.	Value, £.
1910	134,176	31,094
1911	187,241	42,711
1912	140,000	31,183
1913	65,074	8,126
1914	87,279	25,877

The quantity and declared value of green vegetables exported in 1914, exclusive of potatoes and onions, were 167,596 crates valued at £22,907, as compared with 141,939 grates exported in 1913, of a declared value of £17,789.

The quantity and declared value of the export of lily bulbs were as follows: 941 packages, of a declared value of £1,867, as against 2,357 packages, of a declared value of £3,470, in 1913.

The quantity and declared value of arrowroot exported in 1914 were 4 tons 5 cwt., valued at £530, as compared with 2 tons 4 cwt., valued at £248, in 1913. (*Colonial Report* for 1913.)

In an article in the *Louisiana Planter* on sugar and the sugar-cane in the British East Indies, special mention is made of a statement by Dr. Barber, that the key to the Java situation is organization, complete governmental control in favour of the manufacturer, and thorough chemical and botanical supervision in the fields and factories.

COMPOSITION AND KEEPING QUALITIES OF CORN (OR MAIZE) MEAL.

The production of kiln-dried corn in Antigua and St. Vincent, and the large amount of corn meal imported into all the West Indian colonies, render of interest the following summary of a Bulletin on the composition of corn meal manufactured by different processes, and the influence of composition on keeping qualities. The Bulletin is No. 215, issued from the Bureau of Chemistry of the United States Department of Agriculture.

The products of a white-corn mill may be arranged in the following order in regard to acidity: fat, fibre, and ash, beginning with the lowest percentage: grits, meal, flour, feed, and germ. They may be arranged in the following order in regard to protein: flour, meal, grits, feed, and germ. The percentage of nitrogen-free extract is not strikingly different in the grits and meal, but is lower in the feed, and lowest in the germ.

Samples of meal taken from forty-one mills located in thirty-two towns and seventeen States are classified under four heads: (1) whole-kernel, stone-ground meal; (2) bolted, undegerminated meal; (3) degerminated, bolted, roller-ground meal ('cream meal'); and (4) low-grade or 'standard' meal.

Whole-kernel meal at the time of grinding is the same in composition as the corn except in regard to moisture, but soon develops a greater acidity.

Bolted, undegerminated meal contains less fibre than the corn, but no other general rule can be formulated owing to the variable conditions of manufacture.

Degerminated, bolted meal contains less protein, fat, fibre and ash, but more nitrogen-free extract than the corn.

Low-grade ('standard') meal contains sometimes more and sometimes less of each constituent than the corn.

Ton lots of degerminated, bolted meal, with a range in moisture content, were stored at Savannah and Chicago. The lot containing 16·86 per cent. of moisture showed an excess of acidity in twelve weeks, a loss of fat in sixteen weeks, and a musty taste in twenty weeks. The lot containing 15·04 per cent. of moisture only slightly exceeded the limit for acidity (30) in twenty-four weeks, and did not suffer in taste or appearance, while those of 13·41 per cent. or less kept well in all respects up to the end of the experiment (twenty-four weeks).

Carload lots of degerminated, bolted meal, with 15·73 per cent. of moisture, showed an excess of acidity at Savannah in eight weeks, and at Chicago in twelve weeks, but did not suffer appreciably in quality. Highly dried meal with 9·86 per cent. of moisture after twenty-four weeks showed a maximum acidity of only 21·8.

Comparative tests with whole-kernel and degerminated, bolted meal, undried and dried to different degrees, and stored at Savannah and New Orleans, showed the superior qualities of the latter. Even when dried to 10·79 per cent. of moisture, the whole-kernel meal developed excessive acidity in eight weeks, and became rancid in twenty weeks, while with 15·71 per cent. of moisture or higher, in addition to becoming acid, it sooner or later heated and caked. The loss in weight accompanying heating exceeded the loss of moisture.

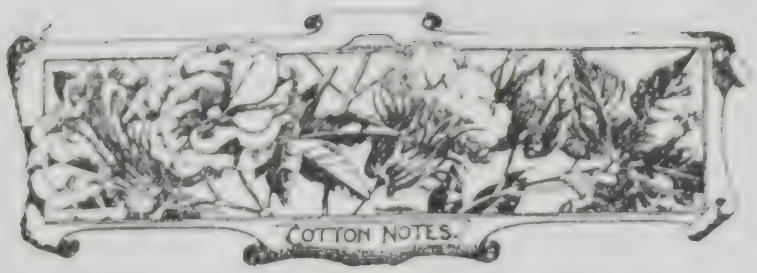
Degerminated, bolted meal containing 13·78 per cent. or less of moisture kept in all respects for twenty-eight weeks, and that containing 15·72 per cent., although it became stale in twenty weeks, did not develop excessive acidity. The undried meal containing 19·20 per cent. of moisture, although it heated within four weeks, unlike the whole-kernel meal did not increase markedly in acidity.

Meal of the two kinds milled April 1914 without drying, and containing about 18·50 per cent. of moisture, spoiled within two weeks at New Orleans. Only the whole-kernel meal developed an excess of acidity.

A study of all the results leads to the conclusion that degerminated, bolted meal, containing not over 14 per cent. of moisture and 1 per cent. of fat, as determined by the method of the Association of Official Agricultural Chemists, properly stored, should keep for six months; with a moisture content of 15 per cent. it should keep three months. Schindler's limit for moisture, viz., $13\frac{1}{2}$ per cent., obtained by drying in an open dish, corresponds to about $14\frac{1}{2}$ per cent. by the method of the Association of Official Agricultural Chemists.

Whole-kernel meal, like cream, should be produced locally and consumed soon after drying; properly dried, degerminated meal, like butter, keeps well during transportation and long storage.

Storage of Manure.—The problem of the storage and fermentation of manure has for long been a subject of discussion, pits and covered courts each having their advantages and disadvantages. A new system by Dr. Giuseppe Beccari, of Florence, Italy, is described in a recent publication from the Imperial Institute of Agriculture, and consists in the storing of the manure in turret-covered courts. The court is a rectangular structure of masonry, divided internally into two compartments about 7 feet high. The floor is paved and provided with drains covered with perforated bricks, through which air passes upwards into the manure, while the liquid manure drips through into a tank. In the top of each compartment there is a trap-opening through which the manure is thrown. Between the two trap-openings a turret is situated, with the object of collecting and fixing the ammonia compounds evolved from the fermenting manure, which enter by the apertures. In the turret, shelves placed above each other and fixed alternately to either side are charged with solid or liquid, alkaline or acid absorbents; these are collected from time to time through a door or other aperture in the turret, which has also openings at the top and bottom for the admission and escape of air. The manure is abundantly sprinkled every four or five days with liquid manure from the tank, and in forty-five to fifty days it is ready for use. Manure made in this way has been found to contain 0·54 to 0·89 per cent. of nitrogen, while manure made in the usual way is considered good when it contains 0·45 per cent. Besides this, there is also the nitrogen fixed by the absorbents in the turret. From the hygienic point of view this system is superior to any other. It has been adopted in several parts of Tuscany, where the cost of erecting such a covered court sufficient for eight to ten head of cattle is about £26. The advantages of the system are (1) that of fermenting the manure in a closed space so that it attains immediately the high temperature of 158 to 167° F., evolving abundant ammonia and preventing the development and action of denitrifying bacteria and consequent loss of nitrogen; (2) that of collecting the volatile ammonia compounds, which are led into a special chamber (the turret), where they are transformed into stable ammonia salts or nitrates, by suitable absorbents, such as clayey earth, peat, charcoal, gypsum, acid superphosphates, or an alkaline medium, and at the same time favour the development of numerous colonies of nitrifying bacteria. (The *Gardener's Chronicle* for November 6, 1915.)



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates November 29, 1915, and December 14, 1915, respectively, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the sales of West Indian Sea Island cotton have been confined to about 120 bales, St. Vincent, chiefly at 18*d*., with some superfine at 20*d*. to 28*d*.

Prices of Sea Island remain steady, but there is practically little or no stock offering.

Since our last report sales of West Indian Sea Island have been confined to 60 bales, including Anguilla $14\frac{3}{4}d$., St. Kitts and St. Vincent 17*d*., and Stains $9\frac{1}{4}d$. to $9\frac{3}{4}d$. Prices remain firm.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 18, 1915, is as follows:—

ISLANDS. The demand has continued for all the offerings of odd bags classing Fine to Extra Fine at 25c. to 27c., the buying being on account of the Northern Mills. Towards the close of the week an advance of $\frac{1}{2}$c. was made for Fine off in class, which has rendered Factors firmer in their views. Then the active and advancing market in Savannah, where Fancy is selling at $26\frac{1}{2}$c., has caused the holders here to ask an advance of $\frac{1}{2}$c. to 1c. over prices previously ruling. This advance has not been paid as yet.

PLANTERS' CROP LOTS. There has been some demand for export, and several crops have been sold on private terms.

The market closed firm, and held $\frac{1}{2}$c. to 1c. higher.

We quote, viz.:

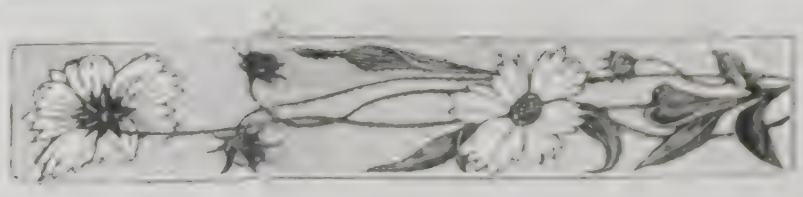
Extra Fine	27c. to 28c.	$= 17\frac{1}{2}d.$-18*d*. c.i.f. & 5 per cent.
Fully Fine	26c.	$= 16\frac{3}{4}d.$ " " " "
Fine	25c. to $25\frac{1}{2}$c.	$= 16\frac{1}{4}d$-$16\frac{1}{2}d.$ " " " "
Fine off in class	24c. to $24\frac{1}{2}$c.	$= 15\frac{3}{4}d.$-16*d*. " " " "

FLORIDAS AND GEORGIAS. The receipts for the week of 1,989 bales were composed largely of purchases in the interior by exporters. The sales also are largely composed of cotton received by exporters from the interior, and now included in the Savannah sales.

With the good demand in Savannah for the limited daily offerings, Factors succeeded in obtaining this week a further advance of $\frac{1}{2}$c., at which all of the offerings were readily taken. We have, therefore, to quote:

Fancy	$26\frac{1}{2}$c.	$= 27\frac{1}{2}$c., landed.
Extra Choice	26c.	= 27c., "
Choice	25c.	= 26c., "
Extra Fine	24c.	= 25c., "

The Exports from Savannah for the week were, to Northern Mills 525 bales, Southern Mills 54 bales, and from Jacksonville to Northern Mills 1,473 bales.



The Coming of the Motor Plough.—Of all the work which has to be done on farms, ploughing is perhaps the most extravagant in power, and the most dependent upon the conditions of the land and weather. On large estates the cable system of steam ploughing has been brought to a high state of perfection. Not many farmers, however, can afford a set of steam-ploughing tackle, nor are there many farms in these islands of such a size as would make its employment a paying proposition. As the *Engineer* points out, what is greatly wanted is a motor tractor, neither too costly nor too complicated—that can be put to some practical use at all seasons of the year, and it would appear that such a machine is now in course of evolution. Apart from the cable-haulage system of ploughing already mentioned, the systems of motor-ploughing are chiefly divided into two classes, namely, those in which the motive mechanism and the plough are two separate units, and those in which the two are combined. For all-round usefulness the separate haulage system possesses important advantages, as motive mechanism can be readily attached to various kinds of implements. The disadvantages urged against the separate tractor are several. One is the necessity for employing two men, one on the tractor and one on the plough. With regard to the type of motor to be used, the steam-engine has not yet been adapted to the self-contained machine, owing to the weight of the water and fuel which it has to carry. So far the petrol engine has monopolised the field, and with spirit at a moderate price, such engines will continue in favour, though developments may be expected in connexion with paraffin engines. As regards the amount of power required, current practice would seem to show that with engines of 20 to 25 h.p., satisfactory work can be done on average land with ploughs of two and even three furrows, and taking cuts 7 inches deep. With this amount of power it is possible to plough from 3 to 6 acres in a day of nine hours. In order to relieve the land from excessive pressure, and give a more direct pull when engaged in pulling the plough, some tractors are designed to run with one driving wheel in the furrow. This method has also the advantage of keeping the furrows parallel, and making steering easy. As several of the leading manufacturers of motor ploughs have adopted this idea, it would seem that the system is based on sound principles. The petrol consumed by a motor plough is said to be about 2 gallons per acre of land ploughed, and its capacity 3 acres per day of nine hours.—(*Journal of the Royal Society of Arts*, for November 12, 1915.)

Awards at the Barbados Show.—Diplomas of Merit have been awarded by the Imperial Department of Agriculture to the following exhibitors at the Barbados Annual Exhibition held on December 15, 1915:—

Basket of rind fruit, first prize awarded to Helen Greaves, Carrington Village; Basket of cabbage, first prize awarded to J. A. Mahon, Esq., Lion Castle, St. Thomas; Holstein Bull (dairy breed), first prize awarded to W. Cecil, Esq., Brandons, St. Michael; Heifer (dairy breed), first prize awarded to Mrs. E. Mahon, Waterford, St. Michael; Plant canes (B. 6450) first prize awarded to Highland Plantation, St. Thomas; Single turkey cock, first prize awarded to F. Burton, Esq., White Park, St. Michael

BAY TREE EXPERIMENTS IN MONTSERRAT.

In his Annual Report, Mr. Robson, Curator of the Botanic Station, Montserrat, furnishes the following information concerning the investigations that have been carried on in that island in connexion with Bay trees. It will be remembered that Mr. Umney, F.C.S. editor of the *Perfumery and Essential Oil Record*, has given considerable attention and encouragement to the production of Bay oil in the British West Indies*, so that the subject of the present article is of more than usual interest.

The experimental plot of 1 acre of Bay trees in Montserrat is in a vigorous condition, and the yield of leaves from which the oil is distilled shows a further increase over the crop obtained in the previous year. It will be recalled that this plot was planted in June 1908; the trees stand 9 feet by 9 feet apart. The reaping of the leaves began in January 1911. The yield of fresh leaves and the actual amount of oil obtained from them during the four years ending December 19.4, are as fol ows:—

	Yield of leaves.		Actual yield of oil.	
1911	1,368	6,189 c.c. =	221 oz. = 14 lb.	approximate.
1912	1,940	8,615 c.c. =	307 oz. = 19 ,,	,,
1913	2,510	12,764 c.c. =	456 oz. = 28½ ,,	,,
1914	3,256	17,687 c.c. =	631 oz. = 39 ,,	,,

There has been a steady improvement in the percentage of oil obtained, which in 1912 was 16·7, in 1913, 18·3, and in 1914, 19·5 oz. per 100 lb. of the leaves as reaped, on an average of twelve monthly distillations.

During the reaping of the leaves in 1914, more care was exercised in the method of collecting for distillation, and only those shoots were removed, all the leaves of which were seen to be mature. This would appear to account for the increase in the percentage of oil, as similar methods of distillation have been adopted as in the previous year.

The monthly distillations have been continued primarily to decide if the leaves at any particular season yielded a better percentage, or an oil of better quality, and the results obtained in 1914, compared with similar data for the previous two years, show that no definite period of the year is indicated as being desirable for the reaping of the leaves. For while the reapings in the early part of 1914 are better, on the average, both in yield and quantity of oil, the results for 1912 and 1913 showed the best returns to be in the months of June and July; nor is it shown that this is a matter that depends entirely on the distribution of the rainfall. Future work will include providing a satisfactory answer to this question on somewhat different lines.

It is obvious though, from experiments, that while the plants are making new growth, the reaping of leaves should be avoided; and the particular periods when this was noticed to develop on this plot were in April and May, and again in October and November.

A matter of some concern is, that the quality of the oil, on the average, has declined, and taking specific gravity and phenol content as the two important features of Bay oil, the average of the distillation for three years is:—

	Specific gravity.	Phenol content.
1912	·9484	55·5
1913	·9460	56·2
1914	·9342	50·5

*See *Agricultural News*, Vol. XIV, No. 350, p. 310.

In the distillations hitherto, it has been the practice to collect the distillate for a period of six hours only, although it was known that a small amount of oil was given beyond this period. To determine further the manner in which the oil was precipitated, a special distillation was carried out in March 1915, when the distillation was conducted for nine hours, each hour's distillate being collected, measured, and, later at the Government laboratory at Antigua, submitted to the usual tests: 150 lb. of fresh leaves were distilled, and each hour's results, with the tests made for phenol content and specific gravity are given:—

Oil obtained in c.c. 519 1st hour, 126 2nd hour, 98 3rd hour, 96 4th hour, 69 5th hour, 58 6th hour, 53 7½th hour, 38 9th hour. Phenol content: 23 1st hour, 78 2nd hour, 89 3rd hour, 93 4th hour, 95 5th hour, 96 6th hour, 99 7½th hour, 96 9th hour. Specific gravity ·8669, 1st hour, ·9241, 2nd hour, 1·0259, 3rd hour, 1·0381, 4th hour, 1·0409, 5th hour 1·0432, 6th hour, 1·0434, 7½th hour, 1·0436, 9th hour.

This distillation was chiefly carried out with a view to deciding if it would improve the quality of the oil to prolong the distillations of the leaves to nine hours instead of six, as has been practised, and the oils up to the sixth hour after being bulked show a phenol content of 54 per cent. with a specific gravity of ·9390. Later, the oils obtained from the sixth to the ninth were added, and the results then were, phenol content 60 per cent., and specific gravity ·9472; thus there is a considerable gain in quality by the addition of the small amount of heavy oil from the sixth to the ninth hour, and in future the distillation will be continued for a period of nine hours instead of six.

In addition to the monthly distillations in 1914, eight special distillations were made to decide (1) if leaves lightly packed in the still gave better returns of oil than those tightly pressed, (2) if sea-water used in the boiler resulted in better returns, (3) comparative results from distilling fresh leaves and those dried for three days; but no consistent results can be said to have been obtained.

It was anticipated that from cultivated areas of Bay trees, and particularly where these are grown in bush form, which enables discrimination to be made in regard to the maturity of the leaves collected for distillation, one of the principal advantages would be the production of an oil of better quality than from uncultivated trees, which is not borne out as a result of this year's experiments, so that the work of the future will chiefly be concerned in deciding what conditions influence the quality of the oil.

On the question of whether Bay oil deteriorates in quality on keeping, tests made by Dr. Tempany show that there is no change in the phenol content of the oil on a sample kept for two and a half years, but that there is a slight rise in the specific gravity, due, it is explained, to the polymerization of the hydrocarbon myrcene which forms an important constituent of Bay oil.

We notice in an Appendix to *Kew Bulletin of Miscellaneous Information* containing a list of staffs in Botanical Departments at home, and in India and the colonies, that the position of Superintendent of Agriculture in Barbados is stated to be vacant. In spite of rumours of departure which must have reached Kew, Mr. J. R. Bovell still fills the office in question.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial in this issue it is shown that, in spite of the war, the prospects before cotton growers throughout the world would appear to be favourable.

An important article, which should be read by all interested in Sea Island cotton, will be found on page 18.

The results of the recent examinations in tropical agriculture, conducted by the Imperial Department, are published on page 29.

Insect Notes and Plant Diseases deal, respectively with the corn leaf beetle and Burgundy mixture.

Proposed Land Settlements in Queensland.

In connexion with the attempts that are being made in a similar direction in St. Lucia, the news that there is likely to be considerable land settlement in Queensland at the termination of the war is of interest. It is stated in *The Board of Trade Journal* for November 18, 1915, that as a result of the arrangements now being initiated in Queensland and throughout the Commonwealth for settling returned soldiers on the land, there will be a large number of small holdings eventually formed. In connexion with this it is of interest to note that the policy of the present Government in Queensland is to provide settlements in smaller areas for a greater number of people, for that purpose breaking up the large estates already in existence. In St. Lucia, it will be remembered that it is Crown Land and not private property that will be utilized. The journal referred to considers it probable that as these areas in Queensland are brought into more productive use, railways will be constructed in order to provide facilities for the transport of produce and goods from and to the small settlements. In St. Lucia the construction of roads is running parallel with this effort to extend land settlement.

Nature Study in Botanic Gardens.

Some of the ideas embodied in an account of nature study with children at the New York Botanic Gardens, appearing in the Journal of that establishment for November 1915, should appeal to officers in charge of Schools and Gardens in the West Indies.

The New York Botanical Garden occupies about 400 acres in the northern part of Bronx Park, and contains a large museum, two large ranges of conservatories, an old mansion in the hemlock forest on the Bronx river, and many plantations of herbaceous plants, shrubs and trees.

In the programme of exercises arranged by the Bedtime Stories Club of *The Globe*, the children were directed to proceed along different routes through the Garden, and at various points, generally in the conservatories, instructors were stationed to point out and describe various plants of special interest. It may be mentioned here that tropical plants were the chief features of discussion. Several thousand children took part in this instructive excursion, and in every way it was a great success. As the children proceeded along the route selected for each section they were told, in a printed programme supplied to each of them, to try and answer certain questions for themselves. Thus after leaving the conservatories many deciduous and evergreen trees were to be seen: the children had to ask themselves: 'How do trees that drop their leaves on the approach of winter differ in shape from those that are evergreen?' 'Do their leaves also differ in shape?'

Again in another place where xerophytes occurred: 'How do desert plants differ from other plants?' And again in one of the tropical houses: 'How do you explain the different kinds of tea all coming from the same plant?' And 'How many kinds of banana fruit have you seen?'

The foregoing represents a very valuable system of education. In our editorial on the Museum in Practice in a recent issue, we strongly advocated the utilization of Gardens in this way, and the hope may be expressed that an attempt will be made to apply these American ideas, to some extent at least, in the West Indies.

Exhibition in Formosa.

The *Journal of Agriculture*, New Zealand, for October 20, 1915, announces that the Department of Agriculture of that Dominion has been advised by the Japanese Consul-General at Sydney, that an industrial exhibition, promoted by the Governor of Formosa, is to be held at Taihoku, Formosa, from April 10 to May 9, 1916. Cordial invitations to exhibit products are extended to South China, Hong Kong, the Commonwealth of Australia, the Dominion of New Zealand, British India, Dutch India, French India, Siam, and the Philippine Islands. Intending exhibitors are requested to communicate to the Governor of Formosa as early as possible particulars of the exhibits, area of space, and nature of stands required. All articles of exhibition will be admitted free of Customs duty, and the use of floor-space, stands, etc., will be free. For those who desire to erect buildings or annexes special facilities will be given.

Poisonous Principle of Cotton Seed.

Cotton seed meal when fed to pigs has so often proved poisonous to them, that its employment for this purpose is looked upon rightly with suspicion, although it is so largely used as a food for other animals. What substance actually imparts this toxic quality to cotton seed has been a matter of enquiry by chemists for some time.

The *Journal of Agricultural Research*, November 15, 1915, published by the United States Department of Agriculture, contains an article by W. A. Withers and F. A. Carruth, in which satisfactory proof seems to be given, based on experiments by the authors, that the active toxic principle in cotton seed is a substance to which the name *gossypol* has been given. This was first isolated from cotton seed oil, and named by Marchlewski in 1899, but the authors of the article under review seem to have been the first to demonstrate its toxic property, and to have shown that it is more easily isolated from the cotton seed kernels.

It was pointed out in an article by Dr. Tempany in the *West Indian Bulletin* (Vol. X, p. 121), that the spots, observable under a lens when a cotton seed is cut across, varied in colour from a yellowish brown to deep green; and that this deepening of tint was an infallible test of the age of the seed, fresh seed always presenting brown spots, while seed kept for some time showed this by the darkening of these spots. This is a most useful guide in selecting cotton seed for planting, since the seed when kept loses its power of germination quickly.

Messrs. Withers and Carruth have demonstrated that these spots are, as Handueck had pointed out, secretion cavities, and that the secretion contained in them is gossypol, which they isolated successfully. By many experiments, chiefly on rabbits, they proved that this substance was in itself always fatal after a few days when administered to the animals even in small doses daily, or in one large dose. They also demonstrated that the toxic properties of gossypol are destroyed by oxidation. Thus to obtain a non-toxic feed methods have been suggested by Withers and Ray, of the North Carolina Experiment Station, of treating the cotton-seed meal by one of these methods:

(1) Extraction of the gossypol from the kernels with ether or alcohol.

(2) Treatment of the meal with an alcoholic solution of an alkali, which affords conditions for rapid oxidation.

(3) Treatment of the meal with iron salts, which seem to form an insoluble compound with the poisonous principle.

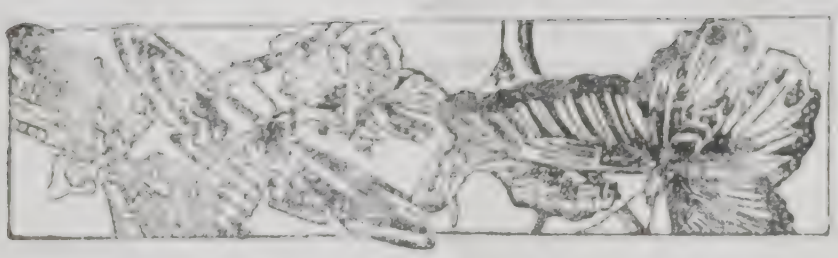
Futher research on these lines may possibly lead to a wide extension of the employment of cotton-seed meal as a foodstuff.

Pasteurization of Cream for Butter Making.

The results of experiments conducted to determine the value of pasteurization in the manufacture of butter, the effect on the flavour of the butter, on the keeping qualities, on the body, on the chemical composition, and on the mechanical losses, are given in the *Experiment Station Record* (Vol. 33) for October 1915. Sour cream was pasteurized by the continuous and vat methods, and the continuous method using the forewarmer. Fairly satisfactory results were obtained by the continuous method of pasteurization during the summer season, but during the winter season, when the cream had to be heated from a low temperature to a high pasteurizing temperature, a metalic flavour often resulted. The amount of fat lost in the buttermilk was greater in the buttermilk obtained from pasteurized cream.

In vat pasteurization the body of the butter was somewhat inferior to that of both the raw cream butter and that from the cream pasteurized by the continuous method, in that it was not so clear, and appeared a trifle sticky. The butter from pasteurized cream, either sweet or sour, scored higher on flavour, both when fresh and after storage, than that from raw cream. Vat pasteurization appeared to be the most efficient method of sour cream pasteurization for improvement of flavour, although the average fat content of the buttermilk from vat-pasteurized cream was 0·23 per cent., as against 0·115 per cent. for buttermilk from cream pasteurized by the continuous method.

Butter manufactured from raw cream had a higher moisture content than butter manufactured from cream pasteurized by the flash method. Prolonged heating of sour cream produced a higher moisture content in the resulting butter. The percentage protein content of the resulting butter was not influenced by the pasteurization of sweet cream, but was decreased by pasteurization of sour cream.



INSECT NOTES.

THE CORN LEAF BEETLE.

In the report of the Barbados Department of Agriculture for 1912-13, an account was given of the Corn leaf weevil (*Myochrous armatus*) as a minor pest of sugar-cane and Indian corn in that island.

This insect has been known in Barbados for several years, but has never become a serious pest. A related insect is reported as being a serious pest of Indian corn in certain sections of the United States. It is called the Southern Corn leaf beetle (*Myochrous denticollis*). This latter insect is recorded as occurring in Grenada, although so far it has not been reported as a pest. A related insect in St. Vincent is *Colaspis fastidiosa*, which has been at times very troublesome, from its habit of attacking very young cotton seedlings. These insects are not weevils; they belong to the Chrysomelidae, the leaf beetles, so called because the adults, and, in many instances, the grubs also, feed on the leaves of plants. The adult beetle (*Myochrous armatus*) in Barbados is known to attack the leaves of sugar-cane plants: they probably eat the roots of these and those of the Indian corn as well.

The Southern Corn leaf beetle (*Myochrous denticollis*) in the United States attacks the roots of Indian corn and of several other plants when in the larval stage, while the adults eat the leaves of the corn plants, often causing the loss of practically all the plants over considerable areas. These attacks usually occur in the early spring when the corn is young.

It appears that the adult beetles hibernate in and near the corn fields, taking advantage of the presence of weeds, trash, and other rubbish to provide suitable protection from the weather.

The clearing up of all rubbish, and not allowing fields to lie idle and grow crops of weeds near the cultivations, would seem to offer a satisfactory means of reducing the numbers of the beetles.

It has been found that early planted corn may be severely attacked, and that when the damage to this is so severe as to necessitate replanting, there is no second attack by the beetles on the same land in the same season. This suggests that in the West Indies when attacks of these beetles have occurred, and repetitions are feared, a trap crop of corn, or other favoured food, might be planted, and when the attack has developed, the trap crop might be removed and the real crop for the season then be planted. Clean cultural methods also would be as profitable in these islands as in the United States.

As a direct remedial measure it has been found that a poisoned bait consisting of 25 lb. wheat bran, or pollard, 1 lb. Paris green, 1 gallon molasses, and the juice of three oranges, with enough water added to make a stiff dough, is effective.

The best success in the use of this poisoned bran bait was obtained when applied late in the afternoon, the bait being scattered lightly on the ground where the beetles are at work among the plants.

This remedy would seem to be worth trial in conjunction with clean culture, for the Myochrous beetles and for the bronze beetle (*Colaspis fastidiosa*) in St. Vincent, and it might be effective also in the case of the weevils of the genus Lachnopus, which have attacked cotton seedlings in Anguilla and Antigua.

H.A.B.

The Storage and Use of Soil Moisture.—The results of field studies of soil moisture accumulation and conservation, conducted for six years on fairly uniform fine sandy loam soil at the North Platte (Nebraska) sub-station, are reported.

Under field conditions, the maximum capacity for water of the soil in question was found to be from 16 to 18 per cent. of its dry weight, of which that above 7 to 8 per cent. is available for plant use. The more important findings are summarized as follows:—

Summer tillage is the most effective means of storing water in the soil, the annual storage by this means varying from 10 to 33 per cent. of the seasonal rainfall, according to the amount and distribution of the rainfall, the effectiveness of the tillage, and the presence or absence of a growing crop. Ploughing seems better than disking for accumulating water in the soil, although disking small grain stubble to kill weeds and stir the surface is generally effective. Artificial mulches of straw or hay are more effective than soil mulches in absorbing and retaining rain-water, and a 3-inch mulch is more effective than a shallower one. Corn, oats, spring wheat, and barley use water from the first 4 or 5 feet of soil, winter wheat at a depth of 6 or 7 feet, and alfalfa and grasses when well established, at much greater depths. Under normally favourable conditions growing vegetation is a greater factor than surface evaporation in removing water from soil, and weeds are frequently the most effective agents in removing available water from soils, and in preventing the storage of water for the use of other plants. Capillary movement is feeble in soils that are dried to any considerable extent below the saturation point, so that in the main, the plant roots to obtain water extend themselves into the soil where available water is present rather than depend upon capillarity.

In order to store water in these soils it is necessary that the soil surface should be in condition to catch rains, and kept loose and rough by cultivation to reduce evaporation and prevent blowing. Weeds should be suppressed, as far as possible, before and after seeding. Crops which will withstand considerable drought or escape drought by maturing early should be chosen. (The *Experiment Station Record*, Vol. XXXI, No. 5.)

A useful summary of the position of bovine tuberculosis in man has appeared in the form of a paper recently issued in the *Reading University College Review*. On the basis of statistics obtained in Manchester, it has been found that the bovine type of tubercle bacillus is the cause of about one-fourth of the cases of other tuberculous diseases at ages up to sixteen, that is, to say, about 3,000 deaths per year. If this be so, bovine tuberculosis is responsible for 30,000 cases of illness at any one time.

CROWN LANDS FOR SOLDIERS IN ST. LUCIA.

1. Crown Lands in blocks of not less than 100 acres will be sold at the rate of 15*s.* per acre, or, part of an acre for 100 acres; and at the rate of 10*s.* per acre for every acre, or, part of an acre in excess of 100 acres. The purchase money shall be paid in five (5) equal annual instalments, the first instalment to be paid on the expiration of the 6th year as from the date of active occupation of the land, and one of the remaining instalments to be paid annually thereafter until the whole of the purchase money has been paid. An applicant for purchase of Crown Lands, provided Regulations 5 and 7 have been fulfilled, may by making a cash payment of the purchase money on the expiration of the 3rd year from the date of active occupation obtain a discount of one-fifth of the purchase money.

2. Half the cost of surveying the land shall be paid prior to occupation, and the other half in the 2nd year of occupation. The fee for the survey of 100 acres will be £20 14*s.*

3. No Crown grant shall be issued until the purchase money has been paid in full, and the conditions of Regulation 5 have been fulfilled, but a Permit of Occupation will be issued from the date of occupation of the land and shall be held by the applicant until the Crown grant has been issued. The grant fee of 6*s.* 3*d.* as fixed by law shall be paid by the purchaser when the grant is issued.

4. The Agricultural Department will supply free of charge, in so far as its resources may permit, economic plants in such quantities as may be deemed necessary for the planting up and development of 50 acres of any area of land agreed to be purchased from the Crown under these Regulations.

5. There shall during the first three years of occupancy be cleared and regularly planted in economic crops to the satisfaction of the Agricultural Superintendent not less than 50 acres of land, and the Agricultural Superintendent shall for the purpose of finding out whether this condition is likely to be or has been performed, have the right at all reasonable times to enter and inspect the lands. The decision of the Agricultural Superintendent as to the fulfilment of this condition shall, subject to the approval of the Governor in Council, be final.

6. No Permit of Occupation, as referred to in Regulation 3, shall be issued to an intending purchaser until he has satisfied the Governor in Council by banker's reference or other substantial proof that his financial position will permit him to cultivate satisfactorily and expeditiously a reasonable proportion of the lands for the purchase of which application has been made by him.

7. No applicant for purchase of Crown Lands shall, without the permission of the Governor in Council, incumber or dispose of his interest in the land before the Crown grant has been issued.

8. Should an applicant for purchase of Crown Lands die before the Crown grant has been issued, the Crown shall resume possession of the land held by the deceased and shall remain in possession of the land until a Crown grant for the same land has been issued to the person or persons whom the Governor in Council may consider has or have the best claim thereto. No Crown grant shall, however, be issued until all monetary claims which the Government may have against the estate of the deceased shall have been settled, nor unless the conditions of the sale shall have been fulfilled. All expenses which may have been incurred by the Government subsequent to death of the applicant and until a Crown grant shall have been issued for the cultivation of the standing crops, and for the reaping, preparation and sale of the produce, shall be deemed as a charge against the estate of the deceased, and such expenses shall be settled before a Crown grant is issued to the person or persons whom the Government may consider has or have the best claim to the land.

Provided that in case of the death of the applicant at any time after occupation and before the fulfilment of the conditions of sale, the Governor in Council may, although he has resumed possession of the land held by the deceased, make such compensation as he may think just and equitable for the buildings erected on the land and for the improvement of the land to the person or persons who has or have the best claim thereto, and retain possession of the buildings and the land for the Crown. Any decision of the Governor in Council as to the amount of the compensation to be given shall be final.

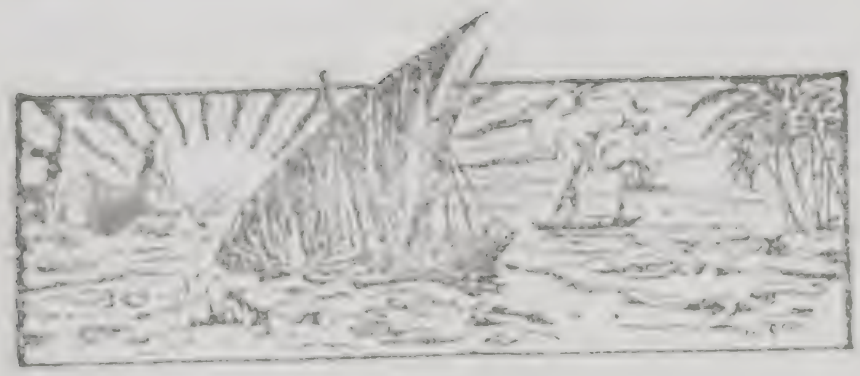
9. Should an applicant for purchase of Crown Lands, before the Crown grant has been issued, absent himself from the Colony without making due provision to the satisfaction of the Governor for carrying out his contract, the Governor in Council may cancel the permit of occupation and resume possession of the land held by the absentee, and may, if he deems fit, make such compensation as he may think just and equitable for the buildings erected on the land and for the improvement of the land. Any decision of the Governor in Council as to whether due provision has been made for carrying out the contract or as to the amount of compensation to be given shall be final.

10. Should any applicant for purchase of Crown Lands fail to fulfil either, or any, of the conditions of sale, the Crown may resume possession of the land, and thereupon the applicant shall vacate the land and any buildings thereon and the Government shall not pay to the applicant any sum of money by way of compensation for improvements to the land or for any buildings erected thereon. The decision of the Agricultural Superintendent as to whether the conditions of sale have been fulfilled, subject to the approval of the Governor in Council, shall be final.

11. Crown grants will be issued subject to reserves along rivers and main ridges for roads and tracks, and of mines, vein, beds, deposits or accumulations of mineral oil.

The Transfusion of Sap.—As bearing on the remarks on the transfusion of sap reported in the *Agricultural News*, Vol. XIV, p. 354, we reproduce the following letter from the Board of Agriculture, London, published in the *Gardener's Chronicle* for October 2, 1915:—

'A plantation of Doyenné du Comice in the hands of an eminent grower at Chart Sutton, near Maidstone, has for several years been very disappointing as to crop. The plantation is arranged somewhat as follows: Several acres of Doyenné du Comice are planted between large blocks of Conference and Fertility; the trees are bush trees on the Quince, 12 feet apart, with one on the free stock at each 24 feet; the latter would become the permanent stock. An attempt was made last season to convey pollen from the adjoining blocks of Conference and Fertility, boys with rabbits' tails carrying the pollen of the two varieties on to several lines of the Doyenné trees. The result was however, very disappointing, there being no set of fruit. The next device was to crown-graft about one tree in six with Glou Morceau (which has been proved in other districts to be a good polleniser for Doyenné du Comice). This was carried out this spring, and in addition grafts of Clapp's Favourite and others were introduced. The result this season is that the portion of the grafted trees below the grafts are bearing heavily, while the ungrafted trees are almost fruitless.'



GLEANINGS.

It is stated in *The Board of Trade Journal* that the exportation of rubber has been prohibited from the Belgian Congo except to English or French ports, or to the port of New York. Special permission must be obtained before consignments of rubber destined for New York can be exported.

The food value of the jack bean (*Canavalia ensiformis*) is dealt with in a note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for November 1914. In regard to the wholesomeness of this bean as a foodstuff for animals, it is stated that 44lb. of crushed beans were given in a ration in some of Kellner's experiments, without apparently producing any ill effects.

It is stated in the *India Rubber Journal* for October 23, 1915, that the average production of rubber per acre in Malaya and Sumatra considerably exceeds that for Java, Ceylon and other countries. The article which provides this information has been written with a view to forecasting the future production at the present rate of planting. It is stated that many people have exaggerated the high yields to be expected.

A good method of advertising is adopted by the American Genetic Association who have issued large sheets of specimen illustrations from the *Journal of Heredity*, the publication of that body. All of these illustrations have appeared some time or other in that journal, and this alone is a sufficient guarantee of their excellence. The above constitutes an interesting, striking and legitimate form of advertising a good cause.

The *Bristol Times and Mirror* for October 18, says that evaporated bananas are never seen on the local market now. Several consignments were received, presumably from Jamaica, but the public did not take to the product. It is suggested that they had grown accustomed to eat the fruit when fresh. The colour was also against the material, for the process adopted changed it to a dark brown, though this in no way affected the flavour.

It appears from an article on the feeding value of palm kernel cake in the *Bulletin of the Imperial Institute* (Vol. XIII, No. 3) that this feeding stuff is already being used to a certain extent by farmers in Great Britain, and although opinions as to its merits differ somewhat, on the whole they are quite favourable. In Hereford the cake is stated to be finding favour for pig feeding, the flesh of pigs fed on the cake being very firm. It will be remembered that until the beginning of the war the employment of palm kernel cake as a feeding stuff was almost entirely confined to the Continent.

The editorial which we published in this Journal some months ago on hedges and wind-breaks attracted some considable attention, and it may interest readers to know that in the *Rhodesia Agricultural Journal* for August 1915, a very useful article appears on the same subject with reference to Rhodesia. Lists of plants recommended for hedges like Tecoma spp., Hybiscus spp., Bougainvillea, etc., are given, and Eucalypts are strongly recommended for wind breaks. *E. pruinculata*, *E. crebra* and *E. microtheca* are amongst those recommended for the drier districts.

Accompanying a letter recently received from Dr. Copeland, Dean of the Philippine College of Agriculture, are recent budgets of the Philippine College of Agriculture and of the Department of Agriculture in Java, respectively. These give the positions and names of the different officers together with the salary of each. The total amount of money spent on the Philippine College of Agriculture for six months is 64,100 pesos. The total for the Java department cannot be definitely stated owing to the omission of certain items, but it amounts to an even larger sum than that recorded above for the Philippines.

Those who may require information as to the relative areas under different crops in Ceylon and their distribution in that island, should refer to *Colonial Reports—Annual*, No. 855, which contains a very instructive map of the Colony in colours. Coco-nut cultivation, which occupies a large area, extends principaliy along the coast with Colombo as the central point. Rubber cultivation is situated chiefly in the Kandy district, where also at higher elevations tea plantations are to be found. The distribution of cacao areas is more or less patchy, and lies on the outskirts of the chief tea and rubber areas.

It is stated in the Demerara *Daily Chronicle* (Mail Edition) December 10, that in view of the fact that it has been stated that rubber cannot be grown on the coastal belt of the Colony, it is interesting to note the Department of Science and Agriculture has recently delivered to the Consolidated Rubber and Balata Estates, Limited, 743 lb. of Para rubber, the produce of the Government Station, for shipment to London, whilst the Departmental export for 1915 amounts to 1,080 lb. The Issorora Rubber Station is within 12 miles of the coast. It is understood that the Consolidated Rubber Company are shipping some 900 lb. of Para rubber from their own rubber cultivations.

We have received three interesting forest bulletins (Nos. 27, 28, and 29) from the Superintendent of Government Printing in India. The first deals with blackwood (*Bolbergia latifolia*, Roxb.). This wood, owing to its handsome appearance, is used largely in the manufacture of high-class furniture. It is also one of the finest timbers known for gun-carriage wheels. The second refers to a wood called Bhauri (*Lagerstroemia parviflora*, Roxb.). This wood is used for house-building, and if it were antiseptically treated with a view to securing immunity to white ant attack, its employment could be considerably extended. The last timber under notice is Sundi wood (*Heritiera minor*, Lam.). This timber is used extensively in boat-building, as planks, boat oars, spars, masts, and for carriage-building as shafts, spokes and naves.

AGRICULTURAL EXAMINATIONS.

Preliminary Examination.

Four candidates presented themselves for this examination: three in Antigua, and one in Grenada. Of the Antigua candidates, two sent in papers of such poor quality as to lead to their rejection by the local examiners. The remaining two papers were answered satisfactorily. In the *viva voce* examination, the local examiners found the Antigua candidate well grounded in the majority of the subjects of the syllabus, his knowledge of agricultural chemistry and elementary botany being decidedly creditable. His knowledge of agricultural operations was rather weaker, and he had no knowledge of the structure and functions of farm animals. According to the local examiners' report from Grenada, the candidate in that island did better in the written paper than in the oral examination. On the whole, his knowledge of the subjects of the syllabus was very creditable.

Intermediate Examination.

One candidate only presented himself for this examination this year. In oral examinations conducted by the agricultural officers and by local planters it was found that he was, on the whole, well up in the subjects under examination, although he exhibited weakness in estate practice, his experience having been gained in work connected with the Experiment Station. His knowledge of cotton was found to be decidedly good, while his acquaintance with sugar-cane cultivation was found to be somewhat weak. The written papers were fairly well answered, except that there was a tendency to be slipshod in the matter of expression.

Results.

Preliminary Examination.

Name.	Island.	Result.
E. F. Shepherd	Antigua	2nd class.
S. Hagley	Grenada	2nd class.

Intermediate Examination.

A. W. Gallwey	Antigua	1st class

List of Examiners.

The Imperial Department of Agriculture is indebted to the following officers and planters for the care and trouble exercised in the conduct of these examinations:—

H. A. Tempany, Esq., D.Sc., F.I.C., Government Chemist and Superintendent of Agriculture for the Leeward Islands.
T. Jackson, Esq., Curator, Botanic Station, Antigua.
R. S. D. Goodwin, Esq., Collins Estate, Antigua.
John Roden, Esq., The Cotton Estate, Antigua.
J. C. Moore, Esq., Superintendent of Agriculture, Grenada.
D. Hedog Jones, Esq., M.A., Principal, Government Secondary School, Grenada.

The examination papers were prepared as usual at the Office of the Imperial Department in Barbados, and the local reports and the corrected papers examined by Dr. Francis Watts, C.M.G., the Imperial Commissioner of Agriculture, and Mr. W. R. Dunlop, the Scientific Assistant.

In the next column will be found the questions set for the Preliminary paper. The questions set for the Intermediate Examination will be published in the next issue of the *Agricultural News*.

Preliminary Examination.

The Preliminary Examination of the Imperial Department of Agriculture was this year held in Antigua and Grenada during November. The following are the questions set for the written paper:—

Of the thirteen questions set not more than nine were to be attempted, which had to include three from section A, three from section B, and one from section C. The remaining two questions were allowed to be selected irrespective of the section.

A. The Soil.

1. To what causes do you attribute the loss of humus in tropical soils? How does this loss compare with the loss in temperate climates? In what ways is the supply maintained in practical agriculture?

2. Explain the rôle of lime in the soil.

3. Describe the various measures that may be employed to ensure the proper ventilation of the soil. Why is soil ventilation necessary?

4. Explain how you would secure a supply of phosphoric acid and potash for the soil without artificial fertilizers.

5. Describe how the nitrogen content of the soil is influenced by bacteria.

B. The Plant.

6. Describe by means of labelled large scale drawings *only*, the structure of any two of the following: (a) a coco-nut, (b) a cacao pod, (c) a lime fruit, (d) a pine-apple.

7. Describe (in words only) the habit of growth and rate of development of any species of bean you have grown.

8. Give an account of the structure and germination of a grain of Indian corn (Maize).

9. Explain the meanings of any five of the following terms: (a) protein, (b) chlorophyll, (c) vascular tissues, (d) respiration, (e) stigma, (f) corbohydrate, (g) saprophyte, (h) embryo.

10. Describe any cross-pollination experiment you have performed

C. The Animal.

11. What is the appearance of a horse's teeth at one year old? Compare this with its dentition at three years.

12 Describe the digestive system of the ox.

13. Record any observations you have made in regard to injurious birds and vermin of agricultural crops.

It is stated in the *Voice of St. Lucia* for December 4, 1915, that some twenty donkeys have been imported by the Government, and will be sold at cost price, the object being to improve the breed of donkeys in the island. Some of the animals have already been landed; others will arrive soon.

Some appreciative reviews of the agricultural report of the different islands, issued through the Imperial Department, appear in the *West India Committee Circular* for November 30, 1915. Special attention is given to Dominica and Grenada. In connexion with the former, an editorial on the subject concludes that not a stone is being left unturned to establish subsidiary industries to limes in Dominica, and that it will be through no fault of the Local Department of Agriculture if this object is not ultimately achieved.

PLANT DISEASES.

NOTES ON BURGUNDY MIXTURE.

In continuation of the article on Burgundy mixture given on page 414 of Volume XIV of this Journal, the following notes embody the results of trials that have been made of certain modifications and adaptations of the mixture.

ADHESIVES. In the article referred to, the addition of milk for the purpose of increasing the adhesion of the mixture is mentioned. The use of resin soap for a similar purpose in connexion with the spraying of trees exposed to heavy rains in India was described on page 270 of the same volume. A comparison of the two methods in application to Burgundy mixture has recently been made by the writer. In the one case milk was added at the rate of 8 oz. to the gallon; in the other, resin soap at the rate of $\frac{1}{3}$-pint to the gallon. The resin soap was made by boiling 2 lb of resin and 1lb. of washing soda in 1 gallon of water until a clear compound was obtained.

The mixtures were applied with a knapsack sprayer, using a Vermorel nozzle with a small aperture to give a misty spray, to a variety of plants including rough and smooth-leaved types. It was found that the resin mixture had the better covering quality, the smaller tendency of the droplets to run together resulting in a smoother and more uniform coating on the leaf.

The sprayed plants have since been subjected to daily drenching with a garden hose with an ordinary rose attachment, and have been exposed to a number of heavy showers. At the end of a fortnight the deposit is not noticeably affected, and there is nothing to choose in respect of the adhesion obtained by the two methods. The superiority of both to the plain mixture in this respect is very marked. For general purposes it would appear that the choice between these adhesives may be governed entirely by considerations of cost and convenience, though in dealing with foliage with water-repelling qualities it seems probable that the resin mixture will have a decided advantage.

The relative cost depends on local and individual circumstances. In Barbados resin costs from 6 to 12c. per lb., soda $2\frac{1}{2}$ to 4c. according to quantity, so that the cost of the resin soap for 1 gallon of the Burgundy mixture would be from ·6 to 1·2c. Separated or skimmed milk may be used where it is available, in which case little will be added to the cost of the original mixture.

PRESERVATIVES. As stated in the previous article, Burgundy, like Bordeaux mixture, should be applied as fresh as possible, since the gelatinous precipitate first formed is totally changed in a few hours to a heavy crystalline precipitate with very inferior adhesion. It has appeared during experiments recently made by the writer that this change may be very considerably delayed in two ways: (1) by the addition of milk as described above for improving the adhesion, and (2) by the addition of a small excess of soda. The latter, contrary to a statement made by E. Bourcart (*Insecticides, Fungicides and Weedkillers*, London, 1913, p. 278), has been found to prevent the change for at least several days. There does not seem to be any practical application for these observations, for there should be no difficulty in making the appropriate quantity of mixture at the time when the spraying is to be carried out.

BURGUNDY PASTE. A mixture of creamy consistency, suitable for painting over wounded surfaces on trees, the ends of cuttings, etc., may be prepared by using the following proportions:—

Copper sulphate	4 oz. in $1\frac{1}{2}$ pints of water
Washing soda	5 oz. in $\frac{1}{2}$ pint of water
Milk	1 pint

A similar paste may be obtained by evaporating, by exposure, the ordinary milk or resin Burgundy until the required consistency is obtained.

STOCK SOLUTION.

Owing to the slowness with which copper sulphate dissolves, it is convenient, where Burgundy mixture is in frequent requisition, to make up a stock solution at the rate of 1 lb. of copper sulphate to 1 gallon of water. Care must be taken before this solution is measured out to make up any loss by evaporation. The soda is best kept in solid form.

W. N.

PHYSIOLOGICAL EFFECTS ON HEVEA BRASILIENSIS PRODUCED BY TAPPING.

In the previous number of the *Agricultural News*, a summary of results and conclusions drawn from experiments carried out at the Experiment Station, Peradeniya, during 1911-13, in tapping rubber trees on one-third circumference, and published in Bulletin No. 19 of the Department of Agriculture, Ceylon, was given. In the present number, the summary of results and final conclusions in regard to tapping on alternate days, and pricking methods, obtained from the same source, are presented.

With regard to tapping on alternate days *versus* daily tapping on alternate months, experiments were carried out on four groups of trees, as follows:—

87 E.—Half herring-bone on one-quarter of the tree's circumference. Four cuts one foot apart to the left of the channel tapped on alternate days. 87 B.—Four cuts one foot apart on the half herring-bone system over one-quarter of the tree's circumference daily in alternate months. 87 D.—Two cuts on the full herring-bone system one foot apart on half the tree tapped on alternate days. 87 C.—Two full herring-bone cuts one foot apart over half the tree. Tapping carried out daily in alternate months. The results are summarized as follows:

87 E. 'When examined there were bridges of untapped bark 3 to 4 inches broad between the tapped area. Though tapping had apparently no considerable effect on the amount of reserve starch in the regions vertically below, or horizontally to the side of, the tapped portion, two out of three of the untapped bridges between the four tapped areas did show considerable evidence of depletion of starch. It may be concluded, therefore, that had tapping been continued over those untapped bridges, the bark renewal at least would have been poor.'

87. B. 'In this case the effects of tapping appeared to be absolutely localized. The bridges of untapped bark between the tapped areas, though narrower than in the case of 87 E, were not deficient in reserve starch to the same extent.'

87 D. 'There was no lack of starch in either the bark or the wood of the untapped bridge between the tapping cuts. There was, as usual, a paucity of starch in the renewing bark and the wood behind it. In sections taken just below the lowest tapping cut, the bark vertically below the right-hand arm of the V showed rather less than the normal quantity of starch, whilst that below the left hand arm was normal. In both cases, however, the condition of the wood was normal. It is probable that the condition of the bark in this respect has less significance than the condition of the wood.'

87 C. 'In this case it may be said that the effects were almost entirely local. The small deficiency in the bark below the left-hand side of the lower V is probably of no significance. In any case there was no effect on the roots, as was the case in 87 D.'

The following are the conclusions drawn: (1) the evidence detailed is in favour of a small number of cuts; (2 there are indications that regular prolonged resting periods are of benefit to a tapped area; (3) a tapping cut extending over half the tree's circumference need produce no more widespread effects in the neighbourhood of the tapped area than a cut extending over one-quarter or one-third of the tree's circumference.

In regard to pricking methods, the following experiments were carried out:—

80 A.—Tree tapped simultaneously by two channels on opposite sides of the tree, each extending from a height of 6 feet down to the base. The trees were tapped daily for the first sixteen days of every month. 80 B.—Two channels at a height of 3 feet tapped together every other day. Opposite sides of the tree. 79 A and C.—Two channels 6 feet high on opposite sides of the tree. Tapping was commenced at the beginning of every two months, and the trees were tapped every other day. (In the foregoing the Bamber Pricker was used.) 87 A.—(The Northway Pricker used.)—Tapping on each side of a channel extending from a height of 5 feet down to the base. Incisions made herring-bone fashion alternately on opposite sides of the channel.

The following are the conclusions:—

The original pricking methods, first introduced in order to obtain the latex in the cells nearest to the cambium, were found to be unsuitable owing to the unsatisfactory nature of the renewed bark. Later modifications have been introduced with the idea of avoiding the cutting off of the downward flow of plant-food said to be caused by tapping cuts. With this idea the trees described had been pricked along vertical, as opposed to oblique, channels. The effects produced on the local food storage had, however, been by no means less drastic than those resulting from ordinary tapping cuts. In the majority of cases, indeed, the effects had been considerably more marked. The untapped bark between the incisions was very poor, and sometimes completely deficient, in reserve starch. The wood behind the tapping channels showed a very poor starch content indeed.

These effects are said to have been probably due, to a great extent, to the formation of wound-wood, which not only required a large amount of reserve material for its formation, but also hindered the lateral transference of reserve material across it.

The experiments yielded the following results:—
(1) That there was a greater withdrawal of reserve starch than is produced by modern paring methods; (2) that the renewed bark was regular; (3) that the percentage of scrap in the total yield of rubber was very high indeed.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of November:—

The month of November started with a fair amount of business being transacted in drugs and chemicals generally, and with very slight alterations in individual values from the previous month. As the month advanced, however, a quieter tone prevailed with most products which come under our review. Among spices, ginger, pimento and mace advanced slightly, while citric acid and sarsaparilla have been easier, as the following details will show.

GINGER.

At auction on the 24th of the month, 236 packages of Jamaica were brought forward, 139 of which sold at the following rates: 69*s.* to 75*s.* for fair to good bold washed, partly wormy. Out of 452 packages of Cochin and Calicut offered, 34 only found buyers, washed rough mouldy Cochin fetching 28*s.* 6*d.*; 35*s.* was the price at which sound Cochin was held, and 30*s.* to 31*s.* for brown rough Calicut.

NUTMEGS, MACE AND PIMENTO.

At the spice auction on the 24th, West Indian nutmegs sold at the following rates: 62's 1*s.* 4*d.*, 70's to 75's 9*d.* to 10*d*, and the smaller sizes from $4\frac{3}{4}d.$ to $5\frac{1}{2}d.$ Mace was represented at this auction by 84 packages of West Indian, 64 of which sold, good pale fetching 2*s.* 4*d.*, fair palish 1*s.* 10*d.*, and pale and reddish 1*s.* 7*d.* to 1*s.* 8*d.*; while for ordinary to fair red, 1*s.* 5*d.* to 1*s.* 7*d.* was paid; and for ordinary to good broken, $6\frac{1}{2}d.$ to 1*s.* 3*d.* per ℔. At the same auction 14 bags of fair pimento realized $2\frac{1}{2}d.$ per ℔, and 75 bags of siftings $1\frac{1}{4}d.$ per ℔.

SARSAPARILLA.

At the first drug auction on the 4th of the month, sarsaparilla was in good supply, grey Jamaica being represented by 28 bales, native Jamaica by 48 bales, Lima-Jamaica by 22, and Honduras by 23. Of the first, 13 bales found purchasers at from 1*s.* 6*d.* to 1*s.* 8*d.* for part mouldy to fair; only 5 bales of the native Jamaica were sold, 1*s.* being paid for good red, 10*d.* for fair red, and 8*d.* for dull and part mouldy. None of the Lima-Jamaica was sold, and only 4 of the Honduras.

ANNATTO SEED, KOLA, LIME OIL, CITRIC ACID, AND VANILLA.

Annatto seed was in abundant supply at the beginning of the month, as many as 123 packages being offered on November 4, none of which found buyers. Kola was also in good supply at this auction, as many as 33 packages being brought forward. Sixteen only found buyers at $5\frac{3}{4}d.$ to 6*d.* for fair dried Grenada and St. Lucia; small washed fetched $5\frac{1}{4}d.$, and sea-damaged, part mouldy, $3\frac{1}{2}d.$ to 4*d.* per ℔. Quite at the end of the month kola continued in fair demand. Six bags of West Indian were sold at $4\frac{1}{4}d.$ to 5*d.* per ℔., and as much as 6*d.* was quoted for good quality. At auction on November 4, 2 packages of hand-pressed lime oil from Dominica were limited at 8*s.* per ℔. Citric acid has been dull of sale throughout the month, commencing at 3*s.* per ℔. At the time of writing it has dropped to 2*s.* 10*d.*

At the last spice auction on the 24th, a striking feature was the very large consignment of vanilla, amounting to 1,841 tins, 1,050 of which were from the Seychelles. There was a good demand, though it was stated that the beans were of doubtful keeping quality. Of the 1,050 tins of Seychelles 700 were sold; 203 tins of Madagascar were offered and about 150 sold, and of Mauritius 320 tins were offered and 170 sold, 57 tins of West Indian were also sold at prices varying from 5*s.* 6*d.* to 7*s.* 9*d.*

MARKET REPORTS.

London.—The West India Committee Circular, December 14, 1915.

Arrowroot—$2\frac{15}{16}d.$ to $3\frac{15}{16}4a.$
Balata—Sheet 2*s.* 6*d.*; block 2*s.* 1*d.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations.; Grenada, no quotations; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—No quotations.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{3}{4}d.$ to 17*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 60/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—7*d.* to 2*s.* 4*d.*
Nutmegs—$4\frac{3}{4}d.$ to $7\frac{1}{2}d.$
Pimento—$2\frac{1}{4}d.$ to $2\frac{3}{4}d.$
Rubber—Para, fine hard, 3/; fine soft, 2/9; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., December 15, 1915.

Cacao—Caracas, 17¼c. to 71¾c.; Grenada, 17c. to 17½c.; Trinidad, 17¼c. to 18c.; Jamaica, 16c. to 16½c.
Coco-nuts—Jamaica and Trinidad selects, $38·00 to $40·00; culls, $25·00 to $26·00.
Coffee—Jamaica, 8½c. to 12c. per lb.
Ginger—14c. to 16c. per lb.
Goat Skins—Jamaica, 45c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
Grape Fruit—Jamaica, $1·75 to $3·25.
Limes—$4·50 to $5·00.
Mace—35c. to 46c. per lb.
Nutmegs—12c. to 12½c.
Oranges—Jamaica, $1·50 to $2·25.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·64c. to 4·70c.; Muscovados, 89°, 3·99c. to 4·05c.; Molasses, 89°, 3·77c. to 3·83c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., December 13, 1915.

Cacao—Venezuelan, $17·50 to $18·00; Trinidad, $17·25 to $18·00.
Coco-nut Oil—88c. per Imperial gallon.
Coffee—Venezuelan, 10c. to 14c. per lb.
Copra—$5·50 to per 100 lb.
Dhal—$6 25 to 6 50
Onions—$4·50 to $5·00 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 lb.
Rice—Yellow, $6·10 to $6·25; White, $6·00 to $6·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., December 14, 1915; T. S. Garraway & Co., December 14, 1915.

Arrowroot—$4·50 to $4·60 per 100 lb.
Cacao—$13·00 to $14·00 per 100 lb.
Coco-nuts—$16 50 husked nuts.
Hay—$1·70 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $95·00 per ton.
Molasses—No quotations.
Onions—$8·00 per 190 lb.
Peas, Split—$10·00 to $12·50 per 210 lb.; Canada, $3·00 per 120 lb.
Potatoes—Nova Scotia, $3·00 to $3·75 per 160 lb.
Rice—Ballam, $6·45 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·60 to $4·25.

British Guiana.—Messrs. Wieting & Richter, December 31, 1915; Messrs. Sandbach, Parker & Co., December 23, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. to 20c. per lb.	20c. per lb.
Cassava—	$1·20	——
Cassava Starch—	$8 to $9	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	9c. to 9½c.	9½c. per lb.
Dhal—	$7·00 to $7·25	$7·50
Green Dhal	——	——
Eddoes—	$1·92 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	8c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·35	$3 25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92	——
Rice—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
Tannias—	$3·12	——
Yams—White	$2·40	——
Buck	$3·12	——
Sugar—Dark crystals	$3·70 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Humidity and the Growth of Crops.

RECENT observations have made it clearer than ever that the chief climatic factor regulating the distribution and growth of crops in the West Indian islands is humidity of the air. The degree of humidity does not necessarily vary with the rainfall; the atmosphere in some parts of Grenada, for instance, contains more moisture than that in some parts of St. Vincent where the rainfall is higher. Humidity in any situation depends upon the degree of exposure, the amount of forest growth, cloud protection from the sun, and the water-holding capacity of the soil. Rainfall is the ultimate cause of humidity, but it is not the only regulating factor.

In the issue of this Journal for January 16, 1915, we published a short summary of a paper on the Gold Coast Cacao Industry, read by the Director of Agriculture of that Colony before the International Congress of Tropical Agriculture. The following extract, in its bearing upon the subject of this article, occurs to us as being well worth repetition: 'It is due to the climate, more than to the soil, that the Gold Coast is pre-eminently a cacao-growing country. The rainfall is not excessive, but the humidity is high owing to the wealth of vegetation. In fact the rainfall is actually lower than in any other cacao-growing country, and a reduction in the humidity would be followed by disastrous consequences. The natives are not fully alive to the seriousness of the position, as the destruction of forest in making new clearings is being somewhat ruthlessly undertaken all over the country, and a Bill, recently introduced by the Government, for the regulation and preservation of the forests, is being vigorously opposed by the native owners of the land.'

This shows in an unmistakable manner the importance of humidity in the cultivation of cacao, and it further points to the necessity of preserving forest growth on the uncultivated areas. The protection of forest is a matter that has been given careful consideration in most of the West Indian islands. It cannot be overstated that such tree growth has a very important influence upon the atmosphere and soil seepage; but it does not increase the rainfall: it conserves the rainfall and increases the proportion of water-vapour in the atmosphere.

Limes and rubber, like cacao, require a moist atmosphere. Exactly why, is a complicated question to answer, but it must be closely connected with transpiration. Further, moisture seems necessary for

a proper biological balance between parasites and their natural enemies. Then, again, a moist atmosphere is generally associated with a still one, which condition is most desirable, if not necessary, for the luxuriant growth of limes and cacao.

Humidity can be artificially induced to some extent by so-called wind-breaks and overhead shade. Indeed it is probable that the value of such protection chiefly lies in the way of maintaining a humid rather than a quiescent state of the air, though it effects both.

The degree of atmospheric humidity is determined, and most people know, by means of a wet and dry bulb thermometer. The greater the difference between the two readngs, the drier the air. The relative humidity is calculated on the difference with the use of a table of factors. This observation of humidity is of as great, if not of greater, importance than the recording of the rainfall precipitations. Very few estates, however, take the trouble to carry out the observation systematically, and scarcely any realize its full significance, which is possibly a reason for omitting the practice. Reference to the Annual Reports of the Local Agricultural Departments shows that even officially, observations on humidity are not recorded in some islands, or at least, are not published. Neglect to do so constitutes a very regrettable omission.

A valuable piece of investigation work would be the collection of humidity figures from different estates in different islands. It might lead to the solution of problems of growth at present unsolved. The trouble with limes in Montserrat, St. Kitts and Nevis has practically been reduced to a humidity basis. If attention had been given earlier to the idea, a large amount of time and trouble, and probably money would have been saved. The conduct of humidity observations under wind-break and overhead shade conditions would be productive of especially interesting results, and might settle once and for all, the conflicting statements that one hears concerning the nature of the benefit derived from this form of protection. Closely allied to foliage protection is that of cheese-cloth, under which tobacco grows more vigorously than in the open. This again is to some extent a question of humidity. It is hoped that this and the foregoing considerations will stimulate the interest of planters in what is for them a very vital question.

SUGAR.

STUDIES IN INDIAN SUGAR-CANES.

Dr. C. A. Barber has issued in the *Memoirs of the Department of Agriculture in India*, the first of a series of papers entitled, Studies in Indian Sugar-canes: No. 1, Punjab Canes. This study deals with the canes of a definite area in which it is believed that some of the most primitive sugar-canes in the world occur, and it is thought that the study of these primitive forms may well be calculated to throw light on the origin of the widely cultivated forms whose systematic study presents enormous difficulty.

Although Dr. Barber laments that this list of morphological characters dealt with in the descriptions is incomplete, it will be found to comprise a far greater number than other observers have yet found it possible to give attention to, and it may well be that the extension of the field of comparison will stimulate other observers in other parts of the world to include a larger number of characters in their critical studies.

The characters dealt with are: general remarks as to distribution; agricultural, and chemical characters; list of specimens examined; general characters of the variety.

Cane measurement: Dead leaves at six months old; length of cane and of shoot after stripping these; total length of cane and number of joints at six and ten months; total length divided by average thickness at middle; length of joints in different parts of the cane; thickness of the cane at various points.

Colour of cane: General; bloom; growth ring; root zone; blackening; blushing; scar line or band; ivory markings, splitting; groove markings.

Characters of the joint: Thickness, ovalness in section; length of mature joint (deducting top), average longest average shorest (basal); shape viewed medially; shape viewed laterally; leaf scar and its ending, lip; circlet of hairs; groove; root zone; growth ring.

Bud: Shooting, burst, etc.; size and form; origin and cushion; flanges; bristles, basal patches and minute black hairs.

Leafy shoot: Colour; terminal tuft of leaves; character of leaf ends; number of terminal joints under 2 inches long.

Leaf-sheath: Length; average longest; colouring, bloom, scarious border and edges; hairs on back and on edges; clasping stem; proportional width of sheath and lamina; ligular processes; ligule and hairs on its edge.

Lamina: Width and length, average extremes, and proportion of these to one another; channelling, etc.; transverse marks; serrature; roportional width of midrib to lamina. And eight groups of Punjab canes are then carefully described and figured according to this scheme.

One of the most striking items provided by an investigation of soil gases dealt with in the *Memoirs of the Department of Agriculture in India* (Chemical Series, Vol. IV, No. 3) is the composition of gases in the neighbourhood of the roots of plants. The proportions of carbon dioxide found are high; but most striking of all is the low proportion of oxygen, and the presence of hydrogen, which has not hitherto been suspected under these conditions. It is stated that the diffusion of gases through soils at a depth of 12 to 15 inches is so efficient as to warrant the conclusion that cultivation of the surface soil is unnecessary for purposes of aeration.



VIRGIN ISLANDS: REPORT ON THE AGRICULTURAL DEPARTMENT AND EXPERIMENT STATION, FOR THE YEAR ENDED MARCH 31, 1915.

Useful work has been continued in the nurseries, and during the year under review the distribution of economic plants increased considerably, totalling 144,793. These included onion slips 115,800, sweet potato cuttings 7,300, coco-nuts 2,769, limes 2,344, and sugar-cane 4,332. In order to meet the demand for plants, the nurseries were extended, a piece of land south of the Curator's quarters being converted into coco-nut, lime, and onion plots.

In the Experiment Station much attention has been given to cotton with a view to establishing a local seed supply. Following up the work commenced last year on the systematic selection of cotton plants with a view to obtaining a strain of cotton suited to local conditions, producing lint of good quality combined with high yields, the various selections made last year were submitted to careful trials in the Experiment Station. The method adopted was: the selection in the field of individual trees showing desirable characteristics, the seed-cotton from which is reaped and the lint submitted to a rigorous examination. From the selected strains of seed raised on the progeny plots an adequate supply has been obtained for planting a considerable area, and as the result of recommendations by Dr. Tempany, Superintendent of Agriculture for the Leeward Islands, arrangements have been made for the establishment of a cotton seed farm at the Experiment Station, from which reliable strains of seed for planting in the Virgin Islands will be obtained—thus obviating the necessity of importing seed for planting. With favourable weather conditions it is believed this seed farm should supply all the seed required for planting in the Presidency. Owing to the importance of the cotton industry in the Virgin Islands it was deemed desirable also to institute manurial experiments to ascertain the requirements of the cotton plant under the conditions of soil and climate which exist in Tortola. Experiments were therefore laid out with Sea Island cotton, but owing to adverse weather conditions very low yields were obtained; the effect of the manures, however, was distinctly marked. In regard to the experiments conducted with Sakellarides, Southern Cross, and Caravonica types of cotton, the results obtained were much below the ordinary returns from Sea Island strains, and again showed that these types of cotton are not suitable to conditions in the Virgin Islands. Hence it is thought undesirable to continue further experiments with them.

The coco-nut demonstration plots constitute an important feature of the work of the Station. The area under this cultivation has been extended, no fewer than 2,769 plants having been distributed during the year. At the Experiment Station, the operations of digging out roots and clearing up an additional 7 acres of land for coco-nuts were carried out, and the plot planted. Owing to the dry weather experienced in August and September, several supplies were found necessary; but with the advent of good rains in April following, the plants commenced to make such marked progress that the successful establishment of the plot is regarded as ensured. The policy of planting catch crops of sugar-cane and cotton through the young coco-nut trees on part of the plot has been followed up; while on the remainder, the plants are kept circle-weeded, the intervening bush being periodically cutlassed back. As a result of one year's growth the trees have attained a height of 9 feet, thus demonstrating the correctness of the view that these lands are well adapted to coco-nut cultivation. As regards this cultivation in the Presidency generally, the localities planted in coco-nuts are situated in the Eastern, North Western, and Western districts of Tortola; some few acres are also established at Virgin Gorda Valley, and at Mosquito Island. In all these districts the soil seems suitable for the crop, and the progress made by the young coco-nut fields during the year is striking. Thousands of acres of land are lying waste which could be converted into paying coco-nut plantations, and it is hoped that the continuation of the present interest in coco-nut growing may lead to considerable future developments.

A considerable amount of activity was displayed in connexion with the onion industry during the year. The raising of seedlings was again carried on at the Station and 115,800 plants were distributed, showing, when compared with the figures for the previous year, that the interest in onion growing in the Virgin Islands is increasing. An attempt was made during the year to organize small shipments on a co-operative basis among growers, and 43 crates containing 2,399lb. were shipped to New York, Barbados, and St. Thomas, the shipment realizing a sum of nearly £15. It is hoped that co-operative methods of marketing the crop May be satisfactorily developed under the auspices of the Onion Growers Association, which has now been formed, and which should lend stability to the industry.

Experiments with other economic crops were continued, and satisfaction must be expressed with the energetic and efficient manner in which the acting Curator (Mr. G. A. Gomez) discharged the duties of his Office during the year under review

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Thursday, January 27, 1916, by the C.R.M.S. 'Chaleur', with the object of paying an official visit to Antigua. Dr. Watts is expected to return by the 'Chaudiere' on February 9.

It is stated in the *Proceedings of the Institute of Chemistry of Great Britain and Ireland*, July to October 1915, that the demand for the services of professional chemists in many matters connected with the war, has steadily increased. Chemists were attached to General Botha's Army in the South-west African campaign, and in France they have been employed in connexion with the necessary retaliation in the matter of employing asphyxiating gases against the enemy. The chief use of chemists, however, has been in connexion with the manufacture of munitions, and in the revival of the dye and glass industries in Great Britain.

PIGS.

A SUCCESSFUL BACON FACTORY.

In this Journal for April 10, 1915, space was devoted to an account of Dr. Watts' scheme for the production of bacon as an industry for these islands. Concurrently an account was given of a bacon factory which is now working in Rhodesia, and a few facts were published concerning the method of curing bacon. The interest which is now being shown in certain West Indian quarters in connexion with pig raising for bacon and pork, makes it desirable to publish further detail concerning the curing of bacon. This information, which is given below, has been abstracted from an article entitled, The Hitching Bacon Factory, appearing in the *Journal of the Board of Agriculture*, England, for July 1915. It may be of interest to point out that this successful factory was established through the initiative of a group of farmers, and that its continued progress is only hindered through inability to obtain a large enough supply of pigs—a circumstance which would not be likely to arise in the West Indies, where, as Dr. Watts has shown, the amount of available land, the nature of the crops that can be grown, and the thrifty growth of the pigs in these islands, would be likely to ensure more than an adequate supply. The article in the journal referred to, because of its importance and useful character, will be reproduced in full in the next issue of the *West Indian Bulletin*. As already stated, we present now the main facts concerning the curing of bacon, since experiments are being made in this connexion in one or two of the ice-making factories in the West Indies.

After the pigs have been cleaned, disembowelled, and the hair removed, the carcases are put in a chilling room at a temperature of 28° F., until the following morning when they are trimmed up and all the ragged pieces removed. After having once more been placed in the chill room for twenty-four hours, the loin stakes are sent to the pie department, and the trimmings to the sausage room for making saveloys, polonies, etc.

After the sides have been chilled for more than thirty-six to forty hours they are dry salted. The first of the process is to inject the pickle of salt and saltpetre (no other chemicals are used) by the aid of a pump. To ensure uniformity in curing, the pickle is first injected into the thick part, i.e. the gammon. The sides are then piled on top of each other, ten sides high, in the curing room, at a temperature of 40 to 44° F. As each side is placed on the top of the one below, it is lightly dusted with fine saltpetre and the thin layer of curing salt. The sides are left in the pile for nine or ten days, according to their weight. At the end of this period they are taken from the pile and the pickle is drained off, after which they are again piled up, this time with the skin uppermost, to drain, dry, and mature for another ten days. The sides are then ready for use as green bacon, or for smoking. If smoked bacon is required, the sides are washed and dusted over with flour, hung in the smoke houses and smoked and dried with hardwood sawdust for from three to four days, according to the weather. In wet weather the drying takes longer.

The article goes on to state that the heads of the pigs are used for making brawn, and the feet find a ready market. The pigs are killed by the humane method of shooting by means of a special appliance, and they are bled afterwards in the bleeding passage where the blood is run into a tank and dried each day to be used eventually as a manure.

Dry-Salting Bacon and Hams.—In connexion with the foregoing, the following recipes taken from a well-known text-book, 'Profitable Pig Raising, may be found useful: 'For hogs weighing not over 125 lb. or 130 lb. each, intended for dry curing, 1 bushel of fine salt, 2 lb. of brown sugar, and 1lb. of saltpetre will suffice for each 800 lb. of pork: but if the meat is large and thick, or weighs from 150 lb. to 200lb. per carcass, from 1 gallon to 1 peck more of salt, and a little more of both the other ingredients should be taken. Neither the sugar nor the saltpetre is absolutely necessary for the preservation of the meat, and they are often omitted. But both are preservatives; the sugar improves the flavour of the bacon, and the saltpetre gives it greater firmness and a finer colour, if used sparingly'

GROWING PLANTS UNDER CHEESE-CLOTH.

Of special interest in connexion with our editorial in this Journal of May 8, 1915, on the question of increasing the plant's efficiency, is the following abstract of a paper in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for December 1914:—

The experiments described in this paper were undertaken in the year 1908-9 at the Cuban Agricultural Experiment Station at Santiago de las Vagas (Western Cuba), with the object of determining the effect on transpiration and assimilation in the tobacco plant of the cheese-cloth shade which is frequently used in that region for shading tobacco. This cloth is a kind of net work of coarse thread with meshes about a tenth of an inch wide; during the middle of the day this cloth casts a barely perceptible shadow; which, however, is more noticeable early in the morning or late in the afternoon.

Six tobacco plants were grown in vessels in the open, and six under cheese-cloth shade. The light intensity under the two conditions was measured by the photometric method. The temperatures were recorded by thermographs; the relative humidity and rainfall were also determined.

It was observed that:

1. The shade of the cheese-cloth tent reduced the total light by about one-third, but the diffuse light showed very little difference on bright days; when, however, there was no bright sun, the total light (all diffuse) was reduced by about one-third.

2. There was no marked difference between the temperature within the tent and that outside. The average daily excess of the temperature outside the tent over that inside was, for sixty days, 0·14°F. It seems that the tendency of the tent to retain heat is balanced by the smaller quantity of radiant energy which passes into it.

3. The relative humidity is higher inside the tent than outside, the difference being more marked during the day, for at night in both stations it reaches 100 per cent. During the day the difference is enhanced by the partial retention of the moisture transpired by the plant.

4. The rate of evaporation is greater in the open than under the tent. The difference in the rates of evaporation in the two stations increases with the development of the plants, and the consequent increase in relative humidity under the cheese-cloth. Besides diminishing the amount of light and increasing the relative humidity, the tent reduces the currents of air: all these changes tend to diminish transpiration.

The plants used in this work were grown from seed obtained from a single self-fertilized mother-plant of a pure strain.

The shade plants attained a nearly uniform height of 6 feet 10 inches, while the height of the sun plants averaged about 5 feet 9 inches. The leaves of the shade plants were much larger and thinner than those of the sun plants, and the internodes of the stem were longer. In sixty days the plants in the open transpired an average of 45·539 litres of water per plant, and required 241·72 c.c. of transpired water per gram of water-free substance produced, while the corresponding figures for the shade plants were 35·212 litres, and 186·90 c.c. The sun plants thus transpired, on the average, about 30 per cent. more water per plant than the shade plants, while the average weight of dry matter produced was, in the mature plants, nearly the same in both sets. It follows that the series having the higher total transpiration also has the highest transpiration per gram of dry plant substance. This is corroborated by the above figures. The quantity of water transpired per unit of dry matter produced is remarkably uniform for the plants within each group. This confirms the conclusion that under the same aerial conditions the quantity of water transpired per unit of dry matter produced is constant, and independent of the nature of the nutritive solutions or of their concentration or of the state of development of the plant.

After a discussion of the observations and opinions of the most competent authorities on the subject of the relation between transpiration and production of plant substance, the writer draws the following conclusions:—

Under the climatic conditions of Western Cuba the transpiration of tobacco plants grown in the open ground is nearly 30 per cent. greater than that of plants grown under the cheese-cloth shade commonly used for shading tobacco in that region. The transpiration per unit area of leaf surface is nearly twice as great in the sun plants as in the shade plants.

The shading of tobacco plants by this grade of cheese-cloth does not seem to result in a diminished production of total plant substances by the shaded plants, as compared with other like plants not shaded. Since, however, the leaves of the shade-grown plants have a much greater total area than those of the plants growing in the open, it is evident that the quantity of plant material elaborated per unit of leaf area is greater in the plants grown in the open.

Although the total production of dry plant substance is not influenced in any marked degree by the cheese-cloth shade, the distribution of this substance is affected in such a manner that in the shade-grown plants relatively less material is deposited in the leaves and more in the stems than in the corresponding organs of the plants grown in full light. No evident influence is exerted on the deposition of material in the roots.

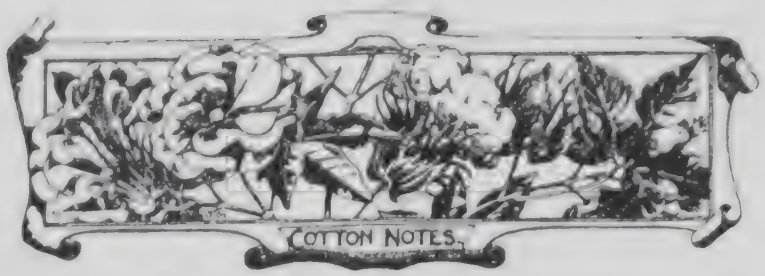
YEAST-FODDER.

Dr. Prinsen Geerligs, in recent letters to the *Louisiana Planter*, has made reference to the new German process of making albuminoids from sugar and salts, chiefly ammonium sulphate, by the action of yeast, which fact is considered as a great assistance for the cattle breeders in times when the supply of maize, bran, oilcake, etc., from overseas, is stopped by the blockade. In the issue of the above journal for October 9, Dr. Geerligs deals with the subject in considerable detail. He says:—

The German Government has seized the various patent rights for the manufacture of yeast-fodder, in order to monopolize the stocks of that commodity, and to distribute the stuff among those who want it. It appears, however, that this method of manufacturing albuminoids on a commercial scale is not so easy as it looked in the beginning, as is very clearly shown in two articles in the *Chemikir Zeitung*.

The author of these articles points out that, in case raw sugar is to be used as one of the raw materials, the cost of the yeast-fodder would be much too high even in war times, not to speak of normal conditions. It is much better to use molasses or the waste waters from the cellulose factories, where wood is cooked with sulphites for being turned into paper stuff. These liquids contain sugar, which may be used by the yeast cells, while the price is not so high as that of the sugar itself. But even in this case the good results are doubtful. The cellulose waste liquid has a very bad smell, and it is not at all sure that the dry yeast coming from it will be eaten by cattle, while in case of molasses it is not at all sure, whether it is wise to sacrifice such a well-known and fully appreciated fodder as molasses in order to get, with great expense and not at all in a sure way, another cattle food, of which we do not know anything.

The great difficulties connected with the formation of yeast from sugar and ammonium sulphate consist chiefly in the fact that the liquid must be very much diluted, and kept in constant movement at a given temperature with huge quantities of air, while in order to obtain a good assimilation of the sugar, the amount of yeast cells to start with must be enormously large. Besides, it is not possible to start the operation with part of the yeast obtained, but the initial yeast must be prepared beforehand, which requires again much expense. The liquid must be so much diluted as to contain no more than 1 per cent. of dry substance. In higher concentrations the yeast will not only grow and use sugar to that end, but ferment same into alcohol and carbonic acid, and destroy it in this way. One hundred kilos. of sugar require 50 parts of nutrient salts, and thereby yield 150 parts of dry substance, which, in a concentration of 1 per cent. yields a quantity of 15,000 parts. This large quantity is to be kept at a given temperature and supplied with enormous amounts of air, requiring mighty air-pumps and enormous tanks. After the action is over the yeast has to be separated from the liquid and the latter disposed of, which is also a matter bristling with difficulties. We find figures on the size of the yeast tanks, the capacity of the air-pumps, etc., necessary to drive a comparatively small factory for albuminoids from ammonia and sugar, which clearly show that the process is not yet mature and certainly not able to yield already now considerable amounts of yeast for fodder. Yet it is rumoured that the German Government contemplates the seizure of all the molasses in order to have it transformed into yeast-fodder. The *Centralblatt fur die deutsche Zuckerindustrie* brings an article in which the calculation is made of the number of factories, with the tanks, calorisators, air-pumps, centrifugals, drying houses, etc., which must be erected within a few months' time to convert all of that molasses into nitrogenous fodder. The author of that article points out that after much trouble the farmers have been induced to use molasses as cattle food, of which they have learned to appreciate the value, and now suddenly that useful article would be withdrawn from them in order to make place for a yeast food. It is not in the interest of the industry and certainly not favourable for the health of the cattle if suddenly so large changes are made in the methods of feeding.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 28, 1915, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, the sales of West Indian Sea Island cotton have been confined to odd bags of stained cotton at from 10½*d.* to 11½*d.* per lb. Prices continue firm.

CANONS OF THE COTTON PLANT IN EGYPT.

The following general conclusions drawn by Mr. W. Lawrence Balls, M.A., from his research work on Egyptian cotton, have been extracted from an article in the *Monthly Bulletin of Agricultural Intelligence*, Rome, for August 1915. We give explanatory observations in connexion with the more technical terms employed, at its conclusion.

The old-established conventional methods of cotton cultivation practised by the Egyptain native are the best possible for the given circumstances.

By simple methods the crop can be 'sampled' at a number of Observation Stations, and Crop Records prepared in the form of Curves of Plant Development[1], providing an exact and non-subjective Crop Reporting system, which is also capable of being used for Crop Forecasting on a scientific basis

The deterioration of the yield of cotton per acre in Egypt from 1898 to 1912, was almost entirely due to the rise of the water-table, through the action and inaction both of individuals, and of the State. This effect acts in part directly by decreasing the depth of soil available, but mainly by bringing the water-table into contact with the roots sooner, when it rises as a direct and indirect consequence of the rise of the Nile Flood.

The deterioration of 'quality' within the same period, especially of the Afifi variety, has been caused mainly by increased impurity through admixture and natural crossing.

SPINNING. The best cotton is obtained from pure strains, other things being equal.

The best samples of fine cottons, in the ultimate and absolute test of actual spinning, are those which contain the smallest percentage of abnormally strong hairs.

The opinions of experts based on 'handling' of commercial lint[2], are no guide to the real spinning value and properties of pure strain lint.

PLANT PHYSIOLOGY. The plant is the slave of the Limiting Factor of the environment, above or below ground, at any given moment, and in itself constitutes a perfect recorder of such factors. But, in interpreting such plant-records, due regard must be paid to the Pre-determination of characteristics[3]. An effect may not be obvious until many weeks after it has been determined.

The direct response of growth-processes to the limiting factor is often masked in individual buds and organs by pre-determined Depressant Factors[4], possibly of an auto-toxic nature.

PLANT BREEDING. No system of seed-supply for cotton can be entirely successful, unless it provides against contamination of the stocks by natural crossing, presumably through seed-renewal. This provision can be most cheaply and safely effected by building bee-proof cages of brass wire gauze over the initial propagation plots[5].

Similarly, deterioration through natural selection can only be avoided by the use of pure strains.

The propagation of renewal-seed has been effected at the rate of 1 metric ton of seed alone from a single seed in three generations. Five tons from one seed in the same period is easily practicable.

GENETICS. Mendel's Law of gametic segregation applies to most or all the characteristics of cotton plants, qualitative or quantitative, even in Ægypto-Upland crosses, but with many extraneous complications, even in simple crosses.

These complications include gametic Re-Duplication in more than one ratio[6], and the deformation of measureable characters by Autogenous Fluctuation[7].

IRRIGATION. Cotton flourishes best on soil which is from 2 to 3 metres in depth. Drains should keep the water-table to this level.

In no soil should the water-table be allowed to rise, even 20cm., for more than a day, once the roots have reached it.

The crop actually uses as much as 50 metric tons of water per feddan (of 4,200 square metres) per day in the late summer, at a time when the available water is the main limiting factor of growth.

If the water-table be kept down, the injury resulting from over-watering in late summer and autumn is merely due to the washing away of nutrient soil-salts. A crop on rich soil can stand over-watering.

Skilful deprivation of water hastens the maturity of the crop by a few days, but only at the expense of lint quality, and yield.

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[1] Curves of plant development consist in the graphical representation of a continuous record of the behaviour of the plant. The curves of most practical value are those of flowering and bolling. The curves are only of practical value under the irrigation conditions of Egypt, where the water-supply is a constant factor undisturbed by rainfall.

[2] The term commercial = mixed-strain lint.

[3] Pre-determination of characteristics is exemplified by the case of the development of the length of lint. After the 23rd day of lint development, the maximum is reached, and no environmental change *after* that point will effect this characteristic. In other words, the maximum manifestation of a characteristic is decided at a certain point in the plant's life-history.

[4] A Depressant factor is one like excessive sunlight, which has a retarding influence upon growth.

[5] The sea constitutes a natural cage in the West Indian islands.

[6] Re-duplication is more than one ratio. Information as to the sense in which Mr. Balls uses this phrase is not available.

[7] Antogenous Fluctuation is a term of Mr. Balls' own invention. In this process the manifestation of a character is affected by the inherited nature of the plant body on which it is borne. See 'The Development and Properties of Raw Cotton', p. 10.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. W. N. Sands furnishes this Office with information to the effect that the general condition of crops, with the exception of cotton and cacao, is satisfactory. Some trouble is being occasioned by pests and diseases; by thrips in the case of cacao, and by internal boll disease in the case of cotton. Some difficulty has also been experienced in regard to the control of ants and mole crickets in onion seed beds; but methods have been devised and information has been given to those planters concerned. During November the agricultural officers paid a number of visits to estates, while in December this work was continued on a larger scale in connexion with the visits to the island of the Imperial Commissioner of Agriculture and the Entomologist and Mycologist of the Imperial Department. Work in the Experiment Stations and nurseries has consisted in the picking of cotton, the reaping of Indian corn, the transplanting of onions, and the inspection of coco-nuts. In December, the following plant distribution took place: 2,500 onion seedlings, 175 Gliricidia cuttings, and 300 sweet potato cuttings. The weather has been fairly good, though somewhat uneven as regards rainfall.

ST. LUCIA. Observations relating to staple crops in December are as follows: cacao, crop about normal; limes, crop slackening; sugar, reaping about to commence. In the Experiment Station, work has consisted in preparing beds, sowing and transplanting limes, transplanting orange stocks, distributing lime plants, cassava cuttings and banana suckers. Mr. A. J. Brooks, who furnishes us with this information, records the following plant distribution for December: lime plants, 1,000; oranges (budded), 31; decorative and economic 45; total, 1,076. The number of cassava cuttings and banana suckers sent out was considerable, namely, 2,500 and 500, respectively. The driving roads and entrances in Castries Botanic Gardens are being improved. The Government Lime Factory has received a visit from the Head of the Agricultural Department of Martinique, who was desirous of obtaining information relating to its management. The rainfall during the month has been considerable.

DOMINICA. Mr. Joseph Jones writes to say that during December the local price paid for good yellow limes rose from 4*s*. to 6*s*. per barrel. The cable quotations for concentrated juice showed a further drop to £23 per pipe. The market, however, according to recent advices from England is quite steady, and may be expected to remain so throughout the New Year. In the nurseries the usual routine work has been continued, while in the lime and cacao experiment stations, picking and recording of crops have been the chief feature of the month's work. In the Botanic Gardens trees have been pruned and roads repaired. Special efforts of the agricultural officers have consisted in visits to several estates. In the chemical laboratory, analyses concerning citrus products have been carried out. The half-yearly examinations of the agricultural pupils were held on December 22. The rainfall for the month has been fairly heavy, namely, 8·4 inches; but that for the year 1914 was the highest on record, namely, 100·01 inches. The usual plant distribution, consisting principally of limes, was effected during the period under review.

ANTIGUA. From an agricultural point of view, writes Mr. J. Jackson, the year 1915 with its 63·60 inches of rain (recorded at the Botanic Station) can be considered a good one. In December as much as 9·25 inches fell. During the month, work in the Experiment Stations has consisted in the distribution of plants, chiefly cane cuttings, and mahogany and Eucalyptus seedlings. The experimental sugar-cane plots were planted at two estates, and molasses manurial experiments laid out. Mr. Jackson goes on to say that the island's cane crop, on the whole, is good: it is estimated at nearly 16,000 tons. The ratoons in some parts are somewhat low but are still making fairly good growth. Some trouble is being experienced with the grubs of brown hard back beetles in fields of corn and onions.

MONTSERRAT. Mr. W. Robson informs us that there has been practically no second crop of cotton this season, and that the destruction of old plants has been pushed forward. The date for completion had been fixed for January 31, and the date at which planting can begin, fixed for March 16. There has been a general response to the offer of pedigree cotton seed, and all the estates are taking seed to plant a seed-field next season. The remaining seed will be offered for sale to small planters, later. The bulk of the lime products, and most of the cotton crop are awaiting shipment. The cotton crop is estimated at about 160 lb. per acre, and the lime crop has been very satisfactory, considering the condition of a large portion of the cultivation. Cotton stainers became numerous in most parts of the island during December. Mr. Robson says the equipment of the building of the Onion Growers Association was to be completed about January 10. An examination has been made of the relative qualities of the Rangpur and West Indian lime, which at present do not appear to be in favour of the new fruit. In the Experiment Station another plot of the local type of the papaw has been planted, and cane cuttings, a large number of lime plants, bay tree seedlings, and horse beans have been distributed. It is stated that a second generation of the Ajowan plant has been damaged by a caterpillar of *Prodenia* sp. A new still has been received for bay oil. Three distillations of the leaves have been made, and the results indicate that during wet weather, a low yield of oil is to be expected. The pink-seeded horse bean recently brought from Porto Rico to Montserrat promises to be very suitable for cultivation between lime trees. It is long-lived, and shows little tendency to bear pods.

ST. KITTS. Owing to the fine rains during the past month of December the canes have continued to make good growth and the prospects of a record crop are well assured. Grinding will start at the Factory on February 1. The general condition as regards pests and diseases, continues Mr. Shepherd, is most satisfactory, only in a very few instances are signs of root disease met with. The young cane crop is being planted rapidly and there is evidence of much greater care being taken in the matter of selecting planting material. The cotton crop is all finished; the returns, generally speaking, were below the average, the rains having been too heavy for the production of a good crop. Special work has consisted in the laying out and planting of the varieties of cane for the Leeward Island experiments. The number of varieties on each station has been increased to twenty-four and the number of stations by two. Analytical work in the Government Laboratory is being continued along usual lines.

NEVIS. Mr. W. Howell states that the cane crop throughout the island is very promising, and that a good return is to be expected. A second crop of cotton has been interfered with by the recent heavy rains. Provision crops are, on the whole, in a satisfactory condition.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial to this number the importance of humidity is discussed as a factor determining the distribution and growth of crops in the West Indies.

An interesting article dealing with infusorial earth as a manure appears on page 47.

A review of the Virgin Islands Report will be found on page 35.

Items of Local Interest appear on page 39.

Insect Notes in this issue have reference to certain dangerous hard backs; while under Plant Diseases will be found an article dealing with imported diseases, and a special note correcting certain information that appeared in a previous issue.

The Possibilities of Cuba's Sugar Production.

The Barbados *Agricultural Reporter* has recently published an interesting leader on the above subject based upon information provided by the *Louisiana Planter.* From this it appears that Cuba's prospects in the matter of sugar production are very great. In each of the seasons 1913-14 and 1914-15, that country produced about 2,600,000 tons of sugar. The crop now coming off will probably reach 3¼ million tons. When the schemes now under consideration for extension shall have been actually realized, it is estimated that the sugar crop of Cuba four years hence will reach 4 million tons. It is believed that in the near future Cuba will be the controlling factor in the world's sugar market. Under the Republican Government great progress has been made in regard to the efficient equipment of central factories, and it does not appear that there has ever been any trouble or anxiety in regard to adequate supply of sugar-cane. Still one is justified in saying that there is yet room for improvement in regard to the cultivation of cane, and the increase in the average yield per acre. If the total output of Cuban sugar be increased by one-quarter and the yield of sugar per ton of cane be increased one-twentieth or one-tenth, as could readily be done, it is believed that these combined influences could be made to result in a production of 5 million tons of sugar in the year 1920.

Co-operative Sugar Works in Queensland.

The Agricultural Organization Society of England has furnished us with information concerning an Act which has been passed in Queensland to provide in detail for the organization of co-operative sugar works in that State, with the help of loans from the Treasury.

Owners or occupiers of a certain quantity of land suitable for the growth of sugar-cane may make application to establish the said works. The applicants must be in a position to subscribe to the capital stock of the company a sum equal to one-third of the capital required for the construction, equipment or purchase of the sugar works. A copy of the articles of association must be forwarded, and the latter must provide that no dividend at a greater rate than 5 per cent. shall at any time after the advances by the Treasurer have been repaid, be declared or paid or credited by the company, and no person shall be qualified to hold shares in the company unless he is a grower of cane under agreement. The conditions necessary for the formation of a company are: that the subscribed capital shall be equal to the cost of construction or of purchase of the sugar works; that the value of the shares allotted to each member may not exceed the value of his land, and that the shares corresponding cannot be sold to guarantee the Government advance for the works to be carried out. The law makes suitable provision for the supervision and inspection of the work of construction, as well as for the management of the business.

Novel Schemes of Instruction in Surinam.

The *Journal of the Board of Agriculture of British Guiana*, for November 1915, contains an interesting article from which the following information regarding agricultural instruction in Surinam is gleaned. Unlike the system obtaining in many of the British colonies, here agricultural instruction is totally separated from primary education, and is put under the supervision of the Director of Agriculture, the aim of the instruction being to give to young agriculturists a theoretical knowledge of agriculture. Lessons are given in agricultural chemistry, botany, zoology, physics, cattle-rearing and dairy work, the tilling of the soil and the use of agricultural tools, and the principles of manuring. A course for young farmers lasts two years of forty school weeks each, and twelve holiday weeks. The first year of the course is devoted to the inculcation of theoretical knowledge in order that the pupils might get an insight into some of the problems of nature, such as the life of plants and animals, the movement of water in the soil, and the atmosphere; and to make them familiar with words and expressions which they will meet in after years, when they read books and papers on agricultural subjects. This is the object of the lessons in chemistry, botany, zoology, and physics. The second year is devoted to practical knowledge—the tilling of the soil, tools, drainage, manuring, cattle-rearing, dairy work, and the cultivation of agricultural plants. Those plants which are cultivated on the farms of the neighbourhood are treated more fully; so also is cattle-rearing fully gone into in cases where the place of instruction is situated in a stock-raising district. Hence the local circumstances fix what branch of agriculture will be treated the more fully.

The minimum age at which pupils are admitted is fifteen years: at that age they are supposed to have had already some practical experience. No maximum age is fixed, so that it is possible at times to have pupils of forty and forty-five years of age—farmers who are at the head of a business, or managers of plantations.

School teachers who wish to take such a course must have a certificate in agriculture. The teachers cannot study by themselves: they must have guidance; and to give them this a regular course of two years is provided, forty weeks being utilized in each year. If after having followed a course of two years a school teacher passes his examination. he gets a certificate with $40 as a premium wherewith to pay his expenses in buying books; and if he succeeds in gathering a number of boys (minimum fifteen) of fifteen years of age and upwards, in his native town or neighbourhood, he is appointed 'headmaster' of a course described under the name of Course for Farmers' Boys, his salary being $220 if he lives in a country district, and $140 in Paramaribo. It might be mentioned that these courses (primary and secondary) were started only in March and May 1915, respectively, therefore it is only after the expiration of two years, that is to say, not before 1917, can the time arrive to speak of any success; but it is pointed out that the agricultural courses in Holland are given according to the same method, and with big success.

The Domestication of Fancy Plumage Birds.

Dr. J. E. Duerden, Professor of Zoology at Rhodes University College, South Africa, and formerly Marine Biologist in Jamaica, has recently written to this Office concerning two articles which we published some months ago on the use of birds, and on egret and heron rearing, respectively. Dr. Duerden has specialized in ostriches, and is specially interested in the production of plumage. It is probably known to the reader that South Africa is the chief centre of the ostrich feather trade, and the enormous development in production has only been rendered possible by domestication of the bird, without which the ostrich would by now have undoubtedly become extinct.

The ostrich industry is at present under a cloud, mainly due to the war; and this has led Dr. Duerden to propose the domestication of other plumage birds along similar lines to those employed with ostriches, the produce of which is more in demand. Our note on egret and heron rearing (in Madagascar) represents the sort of work referred to. The birds are caught and tamed, and then allowed to fly to the marshes to feed in the day, returning to roost at night time. The feathers are removed at certain specific [illegible] without any cruelty, and the birds are carefully looked after and treated after the manner of [illegible]. Dr. Deurden writes: 'I believe there are big possibilities if the matter were taken up thoroughly, but [illegible] (South Africa) could hardly keep the monopoly as [illegible] have practically done with the ostrich. I should think West Indian islands would be very favourable for many kinds of plumage birds.'

While discussing the subject of birds, the attention of the reader may be called to an interesting and useful series of articles that has just begun in the *Journal of the Board of Agriculture of British Guiana* (Vol. IX, No. 1). These articles, which describe the birds of British Guiana, are by the Revd. C. B. Dawson, S.J., M.A. (Oxon.), formerly of British Guiana, and now a resident in Barbados.

The St. Lucia Lime Juice Factory.

Forty-one casks of concentrated lime juice were shipped from the Government Lime Juice Factory in St. Lucia up to December 1, and fifteen awaited shipment, making a total of 59 casks against a total output of 43 for last season. At the time this information was received the bonuses due to vendors were being sent out. Some trouble was experienced in getting the peasants to come forward with their vouchers and receive the sums due to them. As the principle of profit-sharing becomes better known, this difficulty amongst the peasants will gradually disappear. It seems that there is a certain amount of suspicion that the bonus is in the nature of borrowed money, and will eventually have to be repaid to the Government. It is understood that the parish Priests have been endeavouring to enlighten the people on this point. It may be added that the Lime Juice Factory has proved so successful financially that it is intended to institute an extension. This includes a large boiler and a Crossby oil engine.

INSECT NOTES.

DANGEROUS HARD BACKS.

The subject of hard back grubs in the soil has received consideration in several publications of this Department during the past two or three years. Owing to enquiries recently made at this Office in regard to these insects, the following summary of the present situation has been prepared for the information of West Indian planters.

REFERENCES. During the period from March 21 to June 7, 1913, the Insect Notes in six numbers of the *Agricultural News* (Nos. 285 to 290) dealt with root borers and other grubs in West Indian soils, and these articles were reproduced with illustrations as No. 73 of the Department's Pamphlet Series. In 1914, Pamphlet No. 75, entitled Sugar-cane Pests of the Leeward Islands, discussed further the occurrence of these insects, the damage done by them, and the methods of control, or rather of reducing their numbers. Both these pamphlets were fully illustrated.



FIG. 1. *Ligyrus tumulosus* (about twice natural size).

In January and February 1914, the Entomologist made a visit to St. Kitts and Antigua, which had for its principal object the investigation of the then conditions of the hard back grubs in those two Presidencies, and the information obtained at that time was included in Pamphlet No. 75 already mentioned.



FIG. 3. *Strategus titanus*; the larva (about natural size).

SITUATION IN ST. KITTS. The small brown hard back which occurs in St. Kitts as a pest in sugar-cane fields is *Lachnosterna patruelis*. This insect was found by the Entomologist in 1912, occurring in large numbers in the soil of a sugar-cane field, where the canes were suffering badly from drought, the effects of root disease, and the attacks of termites and other insects. There were so many influences adversely affecting the health and condition of the canes that it was not possible to form an opinion as to the exact part played by the hard back grubs.

These grubs are parasitized by some hymenopterous insect, in the same manner as *Phytalus smithi* in Barbados is parasitized by *Tiphia parallela*.

Tiphia parallela occurs abundantly in St. Kitts, at certain times and in certain localities at least, and it may not be too much to assume that this is the parasite of *Lachnosterna patruelis*; but this point has not yet been proved. It is important that the adult should be raised from some of these parasitic grubs in order that the parasite may be identified. Since the first record of *Lachnosterna patruelis* as a probable pest of sugar-cane in 1912, this insect has been found frequently in the soil of sugar-cane fields, and it is believed to be a pest of some importance as a root feeder: it seems to be specially important in connexion with attacks of root fungus.



FIG. 2. Larva of *L. tumulosus*.



FIG. 5. Brown hard back, *Phytalus smithi* (natural size).

SITUATION IN ANTIGUA. The brown hard back of Antigua is *Lachnosterna* sp. For several years there have been complaints that grubs were seriously injuring sugar-cane in that island. On investigation it always happened that very few grubs were to be found, until at the end of 1911, a field of onions of about 7 acres was very badly injured, almost completely destroyed in fact, and the hard back grubs were then found in great numbers. In 1914 the Entomologist found this insect in large numbers in ripening Indian corn which showed the effects of severe root injury. During 1915 two sugar-cane stools were sent from Antigua to the Head Office. From the soil attached to the roots of these canes thirty-six well-grown hard back grubs, presumably grubs of the brown hard back, were obtained.



FIG. 4. Larva of *P. smithi* attacked by larva of *Tiphia parallela*.

The account given in Pamphlet No. 75, p. 12, of 1,000 of these grubs being collected per acre in the soil of an Indian corn field, and the presence of as many as thirty six grubs in the soil adhering to the roots and bases of two stools of ratoon canes, would seem to indicate that these grubs are capable of occurring in numbers sufficient to cause considerable injury to growing crops.

Not only are ripening plants of corn and cane attacked, but also young plants, and, in particular, newly planted canes are severely injured before they become established, and often many are killed outright, necessitating repeated supplyings in order to get a complete stand.

Up to the present time there is no record of parasitism of this insect in Antigua, nor of the occurrence of the parasitic wasp *Tiphia parallela* in that island.

CROPS AND PLANTS ATTACKED. In St. Kitts, sugar-cane is the only crop reported as being attacked by hard back grubs. In Antigua, the hard back grubs attack sugar-cane, Indian corn, onions, sweet potato, and yams.

RELATED INSECTS IN OTHER ISLANDS. In Barbados, the brown hard back (*Phytalus smithi*) occurs at times in such numbers as to be considered a pest. Generally, however, and in most localities, it is well controlled by its parasite, *Tiphia parallela*.

In Mauritius, where *Phytalus smithi* is a most serious pest, large sums of money have been expended for hand collecting of the grubs and beetles, and attempts have been made to introduce the Tiphia parasite from Barbados.

In St. Croix, a very large beetle, *Strategus titanus*, sometimes injures canes, occasionally becoming a serious pest. This insect has been controlled by the use of a poisoned bait, consisting of megass 100 lb., Paris green 3 lb. (Pamphlet No. 73, p. 23.)

In Porto Rico, *Strategus titanus* occurs as a sugar-cane pest, and in that island also a species of Lachnosterna is known to attack that crop.

APPEARANCE OF HARD BACKS AND THEIR GRUBS. The most common hard back in the West Indies is the black hard back, *Ligyrus tumulosus*. This insect occurs throughout the West Indies, and in many localities is very abundant. It is a scavenger in its habit of feeding, being found in great numbers in the larval stage in decaying vegetable matter, such as manure, megass, trash, etc It is not known to attack any crop or to feed on living plant tissue. It would perhaps be too much to say that *Ligyrus tumulosus* would never feed on living tissue, since other members of the same group, the Dynastides, have this habit. For instance, *Ligyrus rugiceps* is a pest of sugar-cane and maize in the Southern States; *Strategus titanus* a pest of sugar-cane in Porto Rico and St. Croix; *Strategus anachoretus* attacks coco-nuts and sugar-cane in Trinidad; *Dycinetus barbatus* is believed to attack crops in Barbuda. These all belong to the group Dynastides, the normal feeding habit of which group is that of eating dead and decaying vegetable tissue.

The adult *Ligyrus tumulosus* should be well known in the West Indies. Its appearance is well represented by figure 1, and its larva is shown at figure 2.

The larva of this insect grows to be about $1\frac{1}{2}$ inches in length and some $\frac{3}{8}$ to $\frac{7}{16}$ inch in diameter. The general body colour is whitish, the hinder portion showing dark or almost black from the intestinal contents. The head is dark reddish-brown in colour, the mandibles being tipped with black.

The larva of the Antigua brown hard back is easily distinguished from that of Ligyrus. It is smaller, more slender in general build, and when straightened, is seen to be narrower just before the middle than at the head and anal ends. This narrowing in the middle is much more noticeable in all the brown hard backs than in Ligyrus. The legs of the brown hard back grub are longer and more slender, and this is true also of the antennae. The scattered hairs on the body are lighter in the case of the brown hard back grub, and the head is also lighter, and directed more to the front; the mandibles are longer and more slender, and have a suffused black border rather than being black. Once these differences have been noted there should be no difficulty in distinguishing between these two grubs.

The St. Kitts brown hard back grub is even smaller than the Antigua one, and shows the same lighter colouration in the head and hairs on the body.

The general appearance of the brown hard back beetles is shown in Fig. 5, which is an illustration of *Phytalus smithi*. Other brown hard backs resemble this insect much more than they do *Ligyrus tumulosus*.

The general appearance of the Dynastid larva is shown in the accompanying figures, 2 and 3, which show the larvae of *Strategus titanus* and *Ligyrus tumulosus*, while the appearance of the brown hard back larvae, which belong to the Melolonthides, is shown at figure 4. Figure 4 also shows the appearance of the parasite, the grub of *Tiphia parallela*, attacking a brown hard back grub, *Phytalus smithi*.

REMEDIES. Aside from the degree of control exercised over hard back grubs by natural enemies, of which *Tiphia parallela* is perhaps the most important, and the use of a poison bait as in the case of *Strategus titanus* in St. Croix, the control of these insects would seem to depend on collecting the insects, either as adults or grubs, and purely agricultural methods which include rotation of crops, reduction of the numbers of ratoon crops in many cases, the use of trap crops and thorough tillage, with, in some instances, a free use of lime.

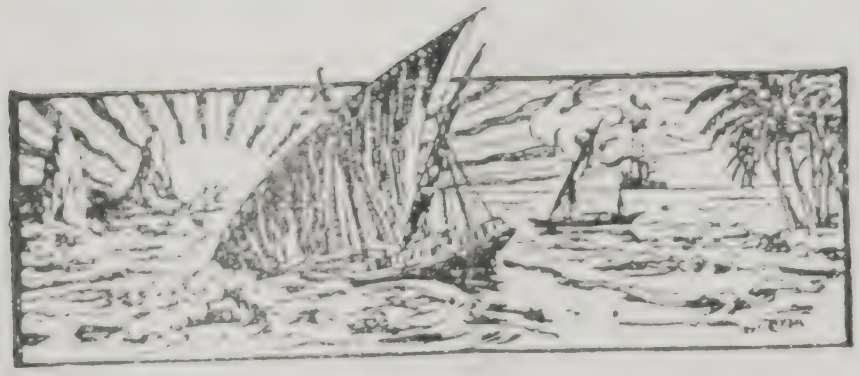
It will be remembered that the term hard back as used here does not apply to any of those beetles having the head prolonged into a snout, which are known as weevils.

The problems presented by the occurrence of hard back grubs in the soil are not confined to sugar-cane growing districts, since many similar insects, i.e., Melolonthid beetles, occur in all agricultural districts, and attack a great variety of crops.

H.A.B.

Anthrax in Elephants and Goats.—It would appear, according to the report of the Civil Veterinary Department, Assam, for 1914-15, that anthrax has been very prevalent in certain areas of that Province. The disease was reported from eight districts and caused 2,056 deaths among living stock alone. In the previous year 1,992 deaths were reported, and from the same number of districts. Diagnosis was confirmed by a microscopical examination in all districts except one. It is of interest to note that an outbreak of anthrax occurred amongst elephants belonging to a certain estate. Two elephants died before inoculation. Diagnosis was confirmed by microscopical examination. Necessary preventive measures were taken and eighteen elephants were inoculated and no further deaths were reported.

In connexion with the above, a case of anthrax in a goat reported in the *Veterinary Record* for October 23, may be of interest. The case is described (from a German source) as follows: 'At 10 a.m. the goat in question was still bright and was feeding, and the milk yield was also normal. At midday she was found moribund, and death followed very speedily. At the post mortem examination the body was tympanitic, much reddish foam was escaping from both nostrils, and sanguineous serum was flowing in drops from both ears. About half a litre (= about $\frac{7}{8}$-pint) of fluid was found in the abdominal cavity. The mucous membrane of the duodenum (one of the intestines) showed hemorraghic inflammation, and was covered with sanguineous intestinal contents. The thoracic cavity contained an $\frac{1}{8}$-litre of fluid. Bacteriological examination revealed fairly numerous anthrax bacilli with distinct capsules.'



GLEANINGS.

We have been notified by the Board of Trade that it has completed the final arrangements for holding a British Industries Fair early this year. The Fair, which concerns china, glass, stationery, and printing products, will be held in the buildings of the Victoria Museum from Monday February 21 to Friday March 3, 1916.

Reference is made in *Farmers' Bulletin*, No. 686 of the United States Department of Agriculture, to the use of sorghum grain as a human food. It is said that it is not much inferior to Indian corn and might be employed more generally. It is only in Barbados, amongst the West Indian islands, that sorghum grain, namely, Guinea corn, is used for human food.

The value of coco-nut husks as a manure is drawn attention to in an editorial in the *Tropical Agriculturist* for November 1915. It is stated that at present, in certain districts of Ceylon, husks are in nearly every instance burnt—a squandering of wealth deplorable under the circumstances Scattering them loosely over the land before rain sets in is regarded as the most satisfactory way of applying this material to the soil.

An interesting collection of negro folklore appears in *The Caribbean*, the magazine issued in connexion with the Boy's Secondary School, Grenada. The compilation, which is by Mr. Hedog Jones, M.A., brings out the striking characteristic of West African folklore, namely, the strong personification of animals, particularly the spider. The article contains also a list of West Indian proverbs, many of which will no doubt be familiar to the West Indian reader.

The production of seedling sugar-canes, which has proved so successful in the West Indies and Java, has not been found so satisfactory in India, especially in North India, where according to the *Agricultural Journal of India* the stamens of the cane arrow do not mature, and pollen is not formed in the cane flowers there. This does not occur, however, in the favoured districts of South India, where already some 40,000 new seedlings have been raised during the past two years.

Discussing the Jamaica lime-growing industry, the *Journal of the Jamaica Agricultural Society* says that lime trees are not grown in Jamaica in regular plantations as they are in Dominica. Lime trees are found through grass pastures, and are in districts subject to heavy sea-breezes and long and severe drought. The Journal, in common with its Demerara contemporary, is publishing a large amount of information of lime cultivation presumably with the object of extending the area under cultivation in the respective colonies.

The behaviour of certain indigo-yielding substances (glucosides) in different species of plants is given attention in the *Memoirs of the Department of Agriculture in India* (Botanical Series, Vol. VII, No. 5). It is very interesting to learn that *Wrightia tinctoria* seed when germinated and grown without nitrogen, increases in glucoside content till it becomes about trebble at about forty days. As nitrogen starvation begins to show, the amount decreases, but is still considerable when the seedlings are on the point of death.

In the *Geographical Journal* for November 1915, a note appears on a paper by a well-known Australian geologist concerning the distribution of leguminosae and past geographical changes. The Leguminosae, like the natural order Myrtacae, appear to have descended from groups of uniform primary types, widely diffused through the tropics in the past, and showing varying modification in the different extra-tropical regions to which they have spread. They have accommodated themselves to temperate regions only in later geological times.

The price of pigs, both bacon and porkers, was very high in 1913, and is still at an abnormally high level. According to a publication of the English Board of Agriculture and Fisheries on prices and supplies of agricultural produce in 1914, the war caused an abrupt rise, and the level reached in August was maintained until the end of the year. High prices for pork and bacon have ruled as well in North America, indicating a general shortage of supplies, which is encouraging to those interested in the establishment of an industry in the West Indies.

The relation between rubber crop and rainfall is a matter of much interest. The *India Rubber World* for January 1, 1916, reproduces two charts showing this relationship in the case of Malaya and Ceylon, respectively. It appears that the period of low rainfall which occurs in February and March has a much greater effect on the crop of rubber in Ceylon than in Malaya; but it is suggested that the figures are no doubt affected by the practice on some Ceylon estates of ceasing or reducing tapping operations during this so-called wintering season.

The total area under tea in the whole of India during 1914 was 622,600 acres, which is 2 per cent. greater than that in the preceding year. The cultivation of tea in India has been concentrated mainly in tracts where a heavy rainfall and a humid and equitable climate permit of repeated flushes and pluckings of the leaf. It is stated in the *Planters' Chronicle* (November 20, 1915) that the industry has to a large extent benefited by the war, though the removal of British troops to Europe has made a considerable difference to the demand for tea in India itself.

Sour Soils and Liming is the title of *Bulletin* No. 261 issued from the Department of Agriculture in the Commonwealth of Pennsylvania. Referring to the oft-mentioned acid-producing effect of commercial fertilizers, it is pointed out that this only holds good to any extent in the case of ammonium sulphates. Thomas slag is mildly alkaline, while nitrates tend to leave alkaline residues. The acid phosphates take very little lime to make them neutral or alkaline. The bulletin in question deals with most of the aspects of liming, and will be found useful for reference.

AGRICULTURAL EXAMINATIONS.

In the last issue we published the results of the recent examinations conducted by the Imperial Department, together with the questions set in the Preliminary Examination paper. The following are the Intermediate papers.

INTERMEDIATE—GENERAL.

(Of the twelve questions set, the candidate was not to attempt more than eight, in which questions 1 *or* 2 and 3 *or* 4, *and* question 12, were to be included.)

1. Give an account of the root borer of the sugar-cane. What other cultivated plants is it known to attack?

2. Compare the life-history of the cockroach with that of a butterfly, and point out as many differences as you can between the adult forms of the two insects.

3. Give a short account of any two of the following: (a) a fruit disease, (b) a leaf disease, (c) a stem disease, (d) a root disease.

4. Describe the making and the uses of any fungicide you are acquainted with.

5. Give in outline an account of the composition and properties of the soils in your island.

6. Describe the different stocks that may be used in the grafting and budding of citrus. Explain their relative advantages.

7. What is your definition of a pure strain of, say, cotton, or Indian corn? What precautions must be taken to maintain a pure strain under estate conditions?

8. State exactly how any two of the following products are graded: (a) sugar, (b) cotton, (c) oranges, (d) onions, (e) cacao. Why is grading necessary?

9. What are the physical and chemical effects of a vegetable mulch on the soil?

10. Give an account of the relative capacities of different tropical crops to withstand exposure.

11. What measures might be adopted to increase the amount of pen manure produced on your estate?

12. Describe in outline the experimental work carried out during the past three years at the Botanic or Experiment Station in your island. Indicate along what lines the most useful results have so far been obtained, stating your reasons.

INTERMEDIATE—SPECIAL CROP SUBJECTS.

SUGAR INDUSTRY.

Part I.—General.

(Six of the eight questions, only, were to be attempted.)

1. Give an account of the areas under different varieties of sugar-cane in your island. What do you regard as the most promising of the newly introduced varieties?

2. How is the supply of humus maintained in the soil of cane fields? Describe concisely the methods employed.

3. State briefly your views as to the use of artificial manures for sugar-canes.

4. What cultivation do you recommend for ratoon canes?

5. What precautions should be taken in selecting cane cuttings for planting?

6. Describe an insect pest of sugar-canes and state what precautions may be taken against it.

7. Describe a fungus disease of sugar-canes and state what precautions may be taken against it.

8. Give an account of the manner in which, in your opinion, proper provision may be made for securing an adequate supply of cane cuttings for planting in the case of an estate selling its canes to a central factory.

COTTON.

(Six of the eight questions, only, among which question 1 must be included, were to be attempted.)

The material required in connexion with question 1 was provided by the Presiding Examiner.

1. Make an examination of the sample of seed-cotton provided, and express the results of the examination in the form of a table.

2. What do you consider the best system of seed supply for local planting? State its advantages.

3. Describe the arrangements you would make in connexion with the picking of a 10-acre field of cotton.

4. Explain the meaning of the terms (a) waste, (b) nep, (c) strength, (d) fineness, (e) hank, as applied to cotton.

5. What maladies are the bolls of cotton subject to? How do you attempt to control them?

6. Give a general account of the cultivation of cotton in rotation with sugar-cane.

7. Show approximately what it costs a peasant to grow an acre of cotton.

8. What experiments are you aware of that are in progress at the present time in the West Indian islands in regard to the manuring of cotton.

PROVISIONS.

(Six of the eight questions, only, among which question 1 was to be included, were to be attempted.)

1. How are yams usually cultivated? Can you suggest any improvements (a) for localities with good rainfall, (b) for dry localities?

2. In connexion with the growing of Indian corn, (a) how much seed per acre is required and how is it planted; (b) what yield would you expect under average conditions of soil and rainfall?

3. Do you recommend 'burning' land? Give your reasons for and against, if any.

4. Describe how you would establish a 2-acre field in onions.

5. Give an account of the grading and co-operative marketing of onions.

6. Mention three varieties of sweet potato which you have found satisfactory. What do you consider a good yield, and what do you understand by the good cooking qualities of a sweet potato?

7. What are the principal salad vegetables? Give in outline their chief cultural features.

8. What are the principal grass and fodder crops in your island? Are these adequate for the requirements of animals all the year round? If not, can you suggest any solution to the difficulty?

Information appears in a recent issue of the Barbados *Agricultural Reporter* to the effect that an Export Association has been formed in Canada whose primary function will be of a two-fold character. In the first place it will seek to create a strategical position for the whole of the Canadian industries, and in a second place to form the work of a commission agent in bringing foreign markets within reach of the wide range of the smaller manufacturers.

PLANT DISEASES.

WILT DISEASE OF SUGAR-CANE: A CORRECTION.

In the article on the above subject published in the issue of this Journal dated January 1, 1916, p. 14, the statement is made that the infested material received from Mr. F. R. Shepherd was from a field of White Transparent cane in St. Kitts. We now learn that owing to the omission of a covering letter a mistake was made in referring the material to this source; it was actually forwarded, at the instance of Dr. Tempany, from an estate in Nevis. The name of the variety affected has not been supplied.

Specimens of the White Transparent cane from the St. Kitts locality mentioned have also been examined, and their diseased condition would appear to be adequately accounted for by the evident severe infestation with Marasmius. The wilt fungus was not detected upon them.

THE IMPORTATION OF PLANT DISEASES.

We learn from a letter addressed by Mr. D. Fairchild, of the U.S.D.A. Bureau of Plant Industry, to Mr. H. A. van Hermann, Chief of the Department of Horticulture, Havana, Cuba, and published in *Modern Cuba* for November 1915, that a destructive disease of bamboos has been found in America on plants imported from Japan and grown at the Chico Plant Introduction Garden.

The letter asks for the examination of bamboos distributed by the Office of Foreign Seed and Plant Introduction, for the purpose of ascertaining how widely the disease has spread, and with a view to taking steps to arrest its further distribution.

It would seem that a strong doubt must arise, if it is not already in existence, as to whether the beneficial results of the United States Department's activity in the exploration of foreign countries in search of novelties are at all commensurate with the demonstrated risk of the introduction of new pests and diseases. Amongst the acquisitions from the East are to be reckoned the chestnut bark disease, which is systematically wiping out of existence one of the most valuable of American timber trees; the citrus canker, which seriously threatens to have the same effect on the grapefruit industry of the southern states; and now, if it takes advantage of its chances, a disease of bamboo which is described as extremely serious, and of the greatest economic importance to the bamboo grower, as it may lead to the death of entire bamboo forests.

The general question is not one which concerns the United States alone, since the existence there of Eastern diseases of tropical and sub-tropical plants greatly increases the chances of their spreading to the countries and islands of the American tropics.

The following information concerning the disease is appended by Mr. Fairchild to his letter.

'*Ustilago shiraiana*, Henn. According to the investigations of Dr. Hori, who has studied the disease on bamboo in Japan, and the observations of the pathological inspectors of this Bureau, the disease always occurs on the young and growing points of the branches. When the young short branches, still covered by the leaf sheaths and bracts, are attacked, they appear somewhat swollen but show no external evidence of smut. The growth of such diseased branches is arrested and finally as the external coverings of the buds fall away, the sooty portions are exposed. When most of the young branches are diseased the winter buds or undeveloped spring buds begin to develop. At a certain stage in the development of the disease a witches broom formation is often apparent

'Dr. Hori states that the wind is the principal factor in the distribution of the disease and observes that the branches of bamboo growing outside of the forest are much more smutted than the inner branches.

'In view of the seriousness of this disease the Department would urgently recommend that all bamboo growers watch their plants for any evidence of smut. As the presence of fungus is not conspicuous in the early stages it is well to scrutinize the young growth closely, opening the glumes and running the fingers along the internodes to discover if the black powdery spores of the smut are present.

'Burning of all diseased plants is the only sure means of eradication. Spraying with Bordeaux mixture when the spring buds begin to develop has been suggested as probably beneficial but it is a doubtful means of control.

'The disease has been found in this country (U.S.A.) on *Phyllostachys puberula* Munro (*P. benonis* Mitforp) and *P. bambusoides* Sieb. and Zucc. (*P. quilioi* Riviere), and in Japan on *Sasa ramosa*, Makino and Shibata, a wild bamboo, and on *Arundinaria simouichino* Makino and Shibata.'

W.N.

Trinidad News.—The following notes are taken from recent issues of the *Port-of-Spain Gazette*:—

According to figures obtained from official records, there were shipped from the Colony during the fortnight ended December 19, 1915, 1,753,499 gallons Trinidad crude petroleum oil. Of this quantity 1,635,624 gallons were shipped to England, 11,000 gallons to St. Kitts, and 680 gallons to Grenada. Of the remainder which was shipped to American ports, 29,971 gallons were taken for bunker purposes. For the same period, 5,860 tons of asphalt were shipped, all of which with the exception of 1,025 tons for Liverpool, were shipped to American ports.

On the Brechin Castle estate, Couva, some very interesting experiments are now being carried out under the control of the Department of Agriculture. The object is to test the ripening capacity of canes month by month. One of the complaints against canes grown by farmers is that they are often delivered to the factory when not quite ripe, and this naturally affects the ultimate weight of sugar. If the Department of Agriculture succeeds, as it bids fair to do, in growing a cane which will ripen in twelve months, that will be a distinct boon to planters in general, and the farmer in particular.

The crushing of limes and exportation of the juice, at the Carenage cassava and limes factory, is fast coming to a close for the season. The output obtained from the Company's fields as also from adjoining lands, has been very satisfactory, all things considered. With respect to the cassava department however, we understand that conditions are just the opposite. The peasantry decline to sell their cassava to the factory (delivered at the yard) for $6 per ton, when they are able to obtain 5*s.* per barrel in the fields (the purchasers often assisting in the reaping), a ton of cassava being equal to at least 10 barrels. The cassava sold in this way is converted into farine.

INFUSORIAL EARTH AS A MANURE.

As the result of a suggestion made in this Journal for November 20, 1915, as to the possible value of infusorial earth as a moisture absorbent for the soil, Professor Harrison, Director of the Department of Science and Agriculture, British Guiana, has furnished this Office with the following hitherto unpublished information relating to experiments and investigations made by him in this connexion many years ago. The information should be of special interest in Barbados where the work recorded was carried out.

In 1883-86 a series of trials was made in Barbados using so-called infusorial earth for top-dressings on cane fields. The fields were top-dressed with very heavy dressings of these earths, the results noted—in every case an increased, to a greatly increased crop over that of not dressed plots—and finally in 1885 the earths used for the dressings were analysed. Professor Harrison took the samples of the earths. The results of the analyses were:—

	Vaughans or Frizers.	Canefield. Air-dried earths. Cream-coloured.	Greenish.	Castle Grant.
Moisture	3·63	1·90	10·78	27·02
Combined water	4·27	2·54	6·15	7·92
Silica and clay	32·74	13·94	66·25	38·12
Iron peroxide and alumina	2·75	·75	12·01	24·50
Calcium Carbonate	54·67	79·91	2·66	·59
Magnesium Carbonate	1·64	·86	1·92	1·50
Phosphoric anhydride	·13	·17	·20	trace
Potash	·05	·02	·06	·09
Soda	·12	·05	·10	·26
	100·00	100·14	100·13	100·00

The nitrogen content was negligible.

The order of efficiency was:—

1. Castle Grant (by far the best)
2. Canefield (greenish)
3. Frizers
4. Canefield (cream)

The Castle Grant fields yielded increased crops from the application until at any rate, the crop of 1889.

The Castle Grant earth was a mottled red, pink and yellow oceanic clay, as smooth and soapy in feel as it well could be. It came from a place close to or almost on the Castle Grant fault north of the estate house and buildings. The cutting was on the west of the road. The mass of it slipped down the hillside with the road in a landslip, possibly, at the time of the hurricane in 1898.

The Canefield greenish earths consisted largely of very fine-grained volcanic debris and oceanic clay from one of the beds of the oceanic series below Mount Misery. Canefield cream-coloured sample was a globigerina earth from the bottom of the oceanic series, whilst Frizers was a radiolarian-foraminiferal marl near Vaughans from about the middle of the oceanic series. Professor Harrison remembers noting on the certificate of the analysis on the Castle Grant earth that it did not give up any appreciable quantity of any manurial constituent of plant-food to hot hydrochloric acid, and that whilst chemically speaking it should be inert, its application had produced heavy crops of canes.

Later Professor Harrison made more complete analyses of some of the earths in a dry state, using fresh samples collected by himself. The figures obtained were:—

	Frizers (Vaughans).	Canefield. Green.	Cream.	Cleland
Combined water	2·89	4·95	2·59	1·84
Quartz	·02	1·44	·05	·01
Colloid silica	19·53	29·31	5·02	7·36
'Clay'	15·02	51·02	3·99	5·69
Iron peroxide	1·40	6·44	·58	1·12
Allumina	2·27	2·34	·52	1·87
Manganese peroxide	·06	·63	1·43	·91
Calcium phosphate	·16	·44	·35	·38
Calcium sulphate	nil	·31	·68	nil
Calcium carbonate	55·23	nil	83·23	79·84
Calcium oxide (as silicate)	1·71	1·27	nil	·48
Magnesium carbonate	nil	nil	1·19	nil
Magnesia (as silicate)	1·44	1·77	nil	·49
Potash	·04	·08	·02	·02
Soda	·23	·09	·23	·29
	100·00	100·00	99·88	100·30

	Castle Grant. Bright Red.	Mottled.
Combined water	8·55	7·46
Quartz	·41	·23
Colloid silica	4·98	3·87
Combined silica	47·65	46·17
Iron peroxide	4·86	4·77
Alumina	25·20	31·54
Manganese peroxide	3·05	2·69
Magnesia	2·57	1·41
Potash	·18	·10
Soda	2·55	1·76
Phosphoric anhydride	trace	trace
	100·00	100·00

The main fact Professor Harrison recollects about these trials is that the highly calcareous earths from which good results were expected were more or less failures, and the argillaceous earths, characterized by their high retentive power for water (compare earlier analyses), were very successful, which was quite unexpected. The former remained on the fields in hard resistent lumps for a long period, the latter rapidly crumbled down and formed a 'mulching', to the land.

Professor Harrison is of the opinion that it would be well worth while repeating these experiments, which are undoubtedly of much interest.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 28, 1915.

ARROWROOT—$2\frac{15}{16}d.$ to $3\frac{15}{16}4a.$
BALATA—Sheet 2*s.* 6*d.*; block 2*s.* 1*d.*
BEESWAX—No quotations.
CACAO—Trinidad, no quotations.; Grenada, no quotations; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—No quotations.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{3}{4}d.$ to 17*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 60/- to 75/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—7*d.* to 2*s.* 4*d.*
NUTMEGS—$4\frac{3}{4}d.$ to $7\frac{1}{2}d.$
PIMENTO—$2\frac{1}{4}d.$ to $2\frac{3}{4}d.$
RUBBER—Para, fine hard, 3/; fine soft, 2/9; Castilloa, no quotations.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., December 28, 1915.

CACAO—Caracas, $17\frac{1}{2}$c. to 18c.; Grenada, $17\frac{1}{4}$c. to $17\frac{1}{2}$c.; Trinidad, $17\frac{3}{4}$c. to 18c.; Jamaica, $16\frac{1}{4}$c. to $16\frac{1}{2}$c.
COCO-NUTS—Jamaica and Trinidad selects, $33·00 to $35·00; culls, $21·00 to $22·00.
COFFEE—Jamaica, $8\frac{3}{4}$c. to 12c. per lb.
GINGER—$13\frac{1}{2}$c. to 16c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 44c. to 46c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $3·25.
LIMES—$4·50 to $5·00.
MACE—35c. to 46c. per lb.
NUTMEGS—14c. to 15c.
ORANGES—Jamaica, $1·50 to $2·25.
PIMENTO—4c. per lb.
SUGAR—Centrifugals, 96°, 4·45c. to 4·64c.; Muscovados, 89°, 3·99c.; Molasses, 89°, 3·68c. to 3·87c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., December 27, 1915.

CACAO—Venezuelan, $17·25 to $18·00; Trinidad, $17·25 to $18·00.
COCO-NUT OIL—87c. per Imperial gallon.
COFFEE—Venezuelan, 10c. to 14c. per lb.
COPRA—$5·50 to per 100 lb.
DHAL—$6·50
ONIONS—$4·50 to $5·00 per 100 lb.
PEAS, SPLIT—$10·00 per bag.
POTATOES—English $2·00 to $2·25 per 100 lb.
RICE—Yellow, $6·10 to $6·25; White, $6·50 per bag.
SUGAR—American crushed, no quotations

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., January 11, 1916; T. S. GARRAWAY & Co., January 16, 1916.

ARROWROOT—$5·00 per 100 lb.
CACAO—$13·00 to $13·50 per 100 lb.
COCO-NUTS—$18·50 husked nuts.
HAY—$1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $100·00 per ton.
MOLASSES—No quotations.
ONIONS—$10·00 per 190 lb.
PEAS, SPLIT—$9·50 to $12·50 per 210 lb.; Canada, $3·00 per 120 lb.
POTATOES—Nova Scotia, $3·00 to $3·75 per 160 lb.
RICE—Ballam, $6·00 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—Muscovado centrifugals, $3·80 to $4·25.

British Guiana.—Messrs. WIETING & RICHTER, December 31, 1915; Messrs. SANDBACH, PARKER & Co. Jannary 7, 1916.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	$14·50
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	18c. to 20c. per lb.	20c. per lb.
CASSAVA—	$1·20	——
CASSAVA STARCH—	$8 to $9	——
COCO-NUTS—	$18 per M.	$18 per M.
COFFEE—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	9c. to $9\frac{1}{2}$c.	9c. per lb.
DHAL—	$7·00 to $7·25	$7·25
Green Dhal	——	——
EDDOES—	$1·92 to $2·16	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	12c.
PEAS—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 48c.	——
POTATOES—Nova Scotia	$3·35	$3·25 to $3·50
Lisbon	——	——
POTATOES—Sweet, B'bados	$1·92	——
RICE—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
TANNIAS—	$3·12	——
YAMS—White	$2·40	——
Buck	$3·12	——
SUGAR—Dark crystals	$3·70 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Measurement of Tilth.

TO produce and maintain a good tilth is one of the principal objectives in good farming, and has always been so since men first turned their attention to the cultivation of land. The earlier English agriculturists were fully alive to its importance, for Jethro Tull—the inventor of the drilling machine, and founder of the principles of dry farming—wrote, about the year 1700: 'the finer the land is made by tillage the richer will it become, and the more plants will it maintain'—an observation as true to-day as it was 200 years ago.

Hence, as might be expected, a large amount of experience has accumulated, which forms the basis on which the modern farmer exercises his ability. To produce a fine tilth, especially under the everchanging climatic conditions of England, requires the exercise of the soundest judgment. It is an art rather than a science, and calls for instinct rather than for reason. One roll at the wrong time will ruin a seed bed, and inappropriate ploughing may spoil a whole field. It is in connexion with these matters that the purely scientifically trained man discovers his inferiority.

On the other hand, there is weakness on the farmer's side, which lies in his inability to understand exactly the effects he produces, and to express varying states of tilth with clearness and precision.

Tilth may be defined as the broken up state of the surface soil resulting from cultivation. Good tilth is closely connected with fineness and friability. Naturally the nature of the soil itself, quite apart from skill in husbandry, will limit the degree of excellence obtainable. This is well seen in the West Indies, where in St. Kitts, for example, the volcanic soil possesses a natural tilth of its own, and scarcely needs any skill to produce a fine surface; while in the neighbouring island of Nevis, and in Antigua also, there are clayey tracts of soil which are most unamenable to cultivation, and in times of drought are literally unworkable, except with dynamite.

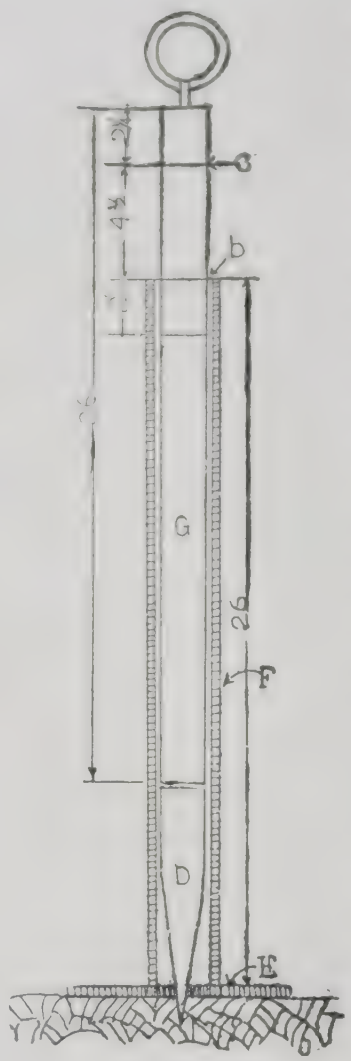
It must not be thought, however, that good tilth is synonymous with a loose texture. A pure sand can never be in good tilth. For one thing the presence of organic matter is essential for the existence of good tilth, and

in certain circumstances, lime also. A soil in good tilth has a characteristically crumbly and slightly sticky feel, and its resistance to the pressure of one's heel can best be described by the English farmer's term of 'kindly'.

Obviously such a complex condition must be difficult to measure. We can determine the water-content of the soil, the proportion of particles of different sizes, the content of organic matter and so on; but tilth is more complex—a sort of resultant in fact, of these different determinations. What seems to us to be the most likely way of obtaining a useful index of tilth is by means of an appliance described after the conclusion of this article. It has been used originally to determine the degree of compactness of soils, which, of course, must be closely related to what we understand by tilth. The device works on the principle that the number of drops of a ram on to a metal spike necessary to make the spike penetrate the soil to a certain depth, is a measure of the relative compactness of the soil.

The appliance is easy to construct, as will be seen from the illustration, and its trial in experiment stations and on estates is to be recommended. The first thing to which attention should be given is the appliance itself. That is to say, before it can be employed to serve a useful purpose in agriculture, the exact significance of the observation it furnishes must be enquired into. To what extent does water-content of the soil affect the instrument? It would probably be found necessary, in comparing two soils, to do so when their water-contents are practically the same, or at least, if they are not, to make determinations and correct the mechanical observations accordingly. Then again the establishment of correlations would be valuable. The dynamometer observations in ploughing a field, which would be an index of relative horizontal resistance in the soil, would probably vary directly with the observations taken with the appliance referred to above in a vertical direction.

The great advantage of being able to measure tilth would lie in the direction of facilitating the making of comparisions. To be able to say that the tilth of one estate is, on the average, so many units better than another would be of distinct advantage; and the same thing would apply to individual fields on the same estate. In a general way such tilth observations would be very useful in soil surveys, and would tend to enhance the practical value of physical analyses.



In manipulating the mechanical device, auger plate E is placed squarely on the ground and pin D is set in the aperture. Sheath F is then slipped over pin D, and ram G is dropped on the pin until it is driven into the soil sufficiently deep for mark *b* on the ram to be even with the top of sheath F. The ram is raised each time to the mark and then dropped freely by its own weight (7,445 gm.). This operation is repeated, recording each drop, until mark *c* on the ram is even with the top of sheath F. Thus, the pin is driven a distance of 4½ inches in the ground each time a test was made. The number of drops necessary to produce this effect is the measure of the relative compactness of soil in the various plots.

Fig. 5. Device for testing the compactness of the soil. (After C. A. Le Clair, in the *Journal of Agricultural Research*, Vol. V, No. 10.)

THE SPIRIT OF THE SOIL.

This is the title of a book by G. D. Knox embodying the results of Professor Bottomley's attempt to prepare a new fertilizer from peat. The book is reviewed by Professor Keeble, F.R.S., Director of the Royal Horticultural Society's Experiment Station, and editor of the *Gardener's Chronicle*, in the issue of *Nature* for December 9, 1915.

The successful results obtained with plants in pots after the application of fertilized peat has been recorded already in this Journal. An explanation of how the material produces its effects has not. Consequently the brief account given by Professor Keeble in his review will be of interest. Certain bacteria possess the power of liberating from peat large quantities of soluble humates. These soluble humates are in themselves of service to plants as sources of food. They serve, moreover, as a culture medium in which nitrogen-fixing bacteria —*Azotobacter chroococcum*, etc.,—multiply rapidly. Hence by adding cultures of nitrogen fixers to sterilized humated peat, the amount of nitrogen in the latter is increased.

At first the remarkable results which were undoubtedly obtained from the application of fertilized peat were attributed to this large nitrogen content; but the fact that growth was not only increased but the habit became sturdier and the root development greater, led to the suggestion that the virtues of bacterized peat are to be sought elsewhere than in the nitrogen content. Professor Bottomley was led to the very interesting conclusion that the growth of plants is conditioned not only by the well-known substance-producing food materials, but also by hitherto unknown growth stimulators. These substances, which he claims have been isolated from peat, Professor Bottomley has called auximones; while Mr. Knox refers to them under the more poetical title of the spirit of the soil. Professor Bottomley

believes that they play a part in plant nutrition somewhat similar to that played by accessory food bodies in the nutrition of animals. Professor Keeble does not think that Professor Bottomley's evidence is strong enough at present to support this conclusion. Nevertheless, Professor Keeble says, it should not be dismissed lightly; rather it is a case like so many in biological science, in which a just judge would order a fresh trial. It is understood that such a trial is to be conducted at Rothamsted, and it is hoped, for the sake of horticulture and agriculture, that it may lead, on one hand, to the demonstration of the fertilizing value of bacterized peat, and on the other, to the just judgment of the case for auximones.

CHANGES THAT OCCUR IN THE RIPENING COCO-NUT.

Few tropical plants afford greater opportunities for profitable study along physiological lines than the coco-nut. This has been realized in the Philippines, where Professor Copeland has been a pioneer in connexion with this special study. A continuation of the work is a thesis in a recent issue of the *Philippine Agriculturist and Forester*, by one of the students of the Philippine College of Agriculture, dealing with what happens in the process of coco-nut development.

In describing changes in colour, size and weight that take place, it is noted that self-pollination is hardly possible in the case of the coco-nut flower, because before the stigmas become receptive, all the staminate flowers have been shed.

During the first period of growth there is an accumulation of sugar and soluble nitrogenons substances in the milk. At this stage the husks are soft, and the nut generally has its greatest diameter along the main axis. During the second period of growth cane sugar appears in the milk, and the specific gravity of the milk is high. Water is lost, though the total weight of the nut continues to increase. The nut begins to increase in diameter. During the closing period of ripening there is a sudden rise in the content of oil in the meat or endosperm. The specific gravity of the milk falls, the shell becomes impervious, and the drying out of the husk results into a loss of weight, which over-balances the gain in weight due to other changes. The meat begins to form when the nut is about six months old. Only invert sugar is present in the meat when it is 0·1cm. thick. The general tendency of the nitrogen content of the meat is to rise.

In continuation it is stated:—

'As the nut becomes older the evaporation of the water from the husk causes an apparent increase in the percentages of meat, shell, and water; but if the actual weights are considered, it will be found that the weight of the shell undergoes little change during the latter stages of ripening, while the weight of water appears to be subject to irregular fluctuations tending towards a decrease. The actual weight of the meat does not appear to increase much, if any, during the last 100 days, though analysis during this time shows that the endosperm changes greatly in composition. Most of the oil in fact is produced after the period when the nuts have become very decidedly brown.

'When the nuts germinate, the percentage of sucrose and invert sugar contained in the milk increases very rapidly. The percentages of these two sugars in the meat increase likewise. The nut that has just begun to sprout appears to make use of the nitrogenous constituent of the endosperm before much of the oil is removed, though the fact that but two nuts were analyzed will leave this statement somewhat in doubt.

'In this locality it appears that nuts require in the neighbourhood of 370 to 410 days to become fully ripe, counting from the moment the spathes open.'

IS THE FERMENTATION OF CACAO NECESSARY?

Realizing the possible importance of this question raised by M. Perrot at the Third International Congress of Tropical Agriculture, we published a note drawing attention to the subject in this Journal for September 11, 1915. M. Perrot's suggestion is whether it is really necessary to subject cacao beans to any fermentation at all, at least on estates. His method of preparation consists in treating the beans with washing soda to remove the pulp, and then steaming the beans in order to prevent fermentation changes during storage and shipment. M. Perrot reported that a firm of chocolate makers in France had stated that beans prepared by the above method were in no way inferior to fermented cacao, and, on the whole, were distinctly more uniform.

In a recent issue of *Tropical Life* (December 1915), an article appears by Mr. A. W. Knapp, B.Sc., F.I.C., containing the results of a technical examination of cacao prepared in Trinidad according to M. Perrot's method. The following are the conclusions drawn concerning the practical value of the new method:—

(1) Cacao obtained by the above method is similar in appearance to ordinary unfermented cacao, and would therefore obtain a lower price than fermented cacao. (2) The new process would require at least as much intelligent control as the present fermentation process actually gets. Wherever any good attempt at fermentation is made, the cacao is a satisfactory commercial product. Those who do not take the trouble to ferment properly are unlikely to go to the expense of having a steam sterilizer fixed. (3) M. Perrot considers that cacao obtained by steaming is in no way inferior to the product obtained by fermentation, but actually says that fermentation may be detrimental to quality. Admittedly, there may be a loss in weight, but the quality of bean, according to Mr. Knapp, is always improved by fermentation. Cacao prepared by the new method has a purplish colour, and a more inferior odour and astringent taste than fermented cacao. (4) Cacao very similar to the steamed cacao (though not quite so free from pulp) is produced by the much cheaper method of simply drying the beans in the sun. Beans thus dried are not liable to spontaneous chemical change as M. Perrot appears to think. (5) Cacao prepared by the new method takes longer to dry than ordinary fermented cacao. (6) If M. Perrot's suggestion be followed, Mr. Knapp points out that it would be necessary to carry on fermentation when the cacao arrives at the factory. If this were done it would be of considerable value, as it would facilitate the supply of cacao in a more uniform condition.

But Mr. Knapp concludes: 'It should be noted, however, that it would only be a step to greater uniformity, as the cacao arriving from one district, or even one plantation, contains several types of beans. Further, the sugary pulp, which is the material in which fermentation starts, has been removed. And last, but not least, the advantage that the manufacturer would get in the way of more complete control of his raw material would be compensated for by the extra cost of this fermentation process. Nor would there be any saving to the planter, for the plant to sterilize and brush the pulp from the beans would be as costly as the present fermenting chambers.

'I regret that I can see no practical advantages in M. Perrot's suggestions, for I admire his brave attempt to apply scientific method to cacao preparation, but for the present I think we cannot do better than encourage the planters to ferment their cacao by those methods which they know to be the best.'

FRUIT.

HOW MANGOES MAY BE CLASSIFIED.

The chaotic condition of mango classification in India has led to the publication of a note on the subject by Dr. W. Burns and Mr. S. H. Pryag, of the Department of Agriculture, Bombay, in the *Agricultural Journal of India*, Vol. X, Part IV, October 1915. The characters of the fruit



Fig. 6.

1. Left shoulder.
2. Basal cavity.
3. Right shoulder.
4. Sinus.
5. Beak.
6. Apex.

are taken as the basis of classification. While this is artificial, it is maintained that if it serves a practical purpose, it is as good as a natural classification.

It is proposed to divide the fruit into three main classes: (1) round fruited—those varieties with fruits in which the length from stalk to apex is equal to or less than the breadth; (2) long fruited—those varieties in which the length is distinctly greater than the breadth; (3) indefinite—those that fall in neither class, on account of being on the border line between the classes and, in addition, of somewhat variable nature.

In making reference to the length and breadth or, in other words, the axes of the fruits, it is pointed out that this forces us to consider in what position a mango fruit should be for description. It is a useful convention, the authors say, to describe a mango fruit lying on its side with the beak to the left. One can then talk of its length (axis between stalk and apex), breadth (axis at right angles to length and parallel to plain in which the mango fruit is lying), and thickness (axis at right angles to breadth and vertical to surface on which the fruit is lying).

The parts mentioned in any such description are shown in the accompanying diagram. In addition to size and three dimensions, weight, colour, surface and the nature, closeness and distribution of the small dots on the skin may be mentioned. After the fruit is cut, the flesh should be described as to taste, colour and stringiness, the skin as to thickness, and the stone as to size, weight, fibre and markings.

If we desired to make a world-wide classification, we should make territorial classes embodying the Indian, West Indian, Cuban, Philippine, etc., mangoes; these could again be grouped under the two great heads of monoembryonic and polyembryonic. So far only monoembryonic mangoes are known in India.

PLANT BREEDING IN CUBA.

Messrs. F. S. Earle and Wilson Popenoe contribute an article of much interest to West Indian horticulturists to the *Journal of Heredity* for December 1915. It shows the rich opportunities that exist in Cuba and the West Indies generally for plant breeders, especially growers of fruit; and it indicates the attempts that should be made to take advantage of these natural resources.

After referring to the work that has been done in Cuba with tobacco and cane, in connexion with which attention is called to selection for resistance to disease, the article proceeds for the greater part of its length to discuss the selection of fruits. The northener coming to Cuba, as to the West Indies generally, is apt to scoff at many of the native fruits, and to compare them unfavourably with temperate fruits. In doing so, it is pointed out, he fails to remember that most of the tropical fruits—practically all with the exception of the pine-apple and the banana—are nothing more than half wild seedlings. It is no wonder then, that many of the tropical fruits, in their present state, are of rather inferior quality. But at the same time their standard is not relatively poor, and one is led to expect that very good results might accrue from the application of modern methods of selection.

Coming to individual cases, mention is made first of the need of a suitable grape for cultivation under tropical conditions. Though the south European grapes are occasionally grown in Cuba and other tropical countries with a certain degree of success, they do not flourish and produce abundantly. There exists in Cuba, however, a native species, *Vitis caribaea*, which might, through hybridization with some of the cultivated grapes, give rise to a race which would be of the greatest value to tropical regions. The vigour and productiveness of this wild grape suggest that it might also be of value as a stock on which to graft varieties of the Vinifera type. Even in its present form this grape is equal, in size and quality, to many of the wild grapes of North America.

Another native plant of possible economic value, recently brought to the attention of horticulturists, is the Cuban walnut (*Juglans insularis*). This tree occurs in the mountains of the island, producing nuts which compare favourably in size with the northern black walnut. The kernels are difficult to remove from the shells, however, and the partitions are thick. It is pointed out that there are very few nuts which succeed in Cuba or in the tropics generally, and the addition of a walnut to those already cultivated would be a distinct advance.

Opportunities with the mango are especially great. Nearly all Cuban mangoes are polyembryonic, and reproduce themselves more or less true to type when grown from seed. In the East most of the mangoes are monoembryonic, and the seedlings do not come true to type. It may be mentioned here that the seeds in a mango are not produced sexually as in most fruits, but by a process of budding. Hence raising plants from polyembryonic mangoes is really a form of vegetative and not sexual reproduction. In the

article under consideration an account is given of certain well-defined types of Cuban mangoes, which should be consulted for further detail.

The next fruit considered is the avocado. Unlike the mango, the avocado does not come true from seed, and seeds from an oval, green avocado may produce round, oblong or pyriform fruits of green or purple colour. For this reason the Cubans do not recognize in a popular way any different classes of avocado. Some work has been done in the matter of budding selected varieties in Cuba, and it is hoped that this will be continued. The most important point in the selection of varieties at the present time is lateness of ripening, since it is the late fruits which bring the highest prices when shipped to northern markets. Keeping quality is also important.

Of the other Cuban fruits which deserve special attention is the custard apple. Crosses have been made between the sugar apple and the Cherimoya, and these have demonstrated the great possibilities that exist. It is explained that the Cherimoya, without doubt the finest flavoured of the cultivated Anonas, does not attain perfection in a truly tropical climate. The sugar apple, on the other hand, is perfectly at home and fruits abundantly. The hybrid between these two species is a plant with foliage remarkably similar to that of the Cherimoya, and with fruits a little longer than the average sugar apple, with the divisions less deeply incised, and with a more pleasant, slightly aciduous flavour, almost midway between that of the Cherimoya and the sugar apple. It fruits somewhat more abundantly than the Cherimoya, but less so than the sugar apple. Crosses should be made in Cuba and the West Indies between these species as well as between the sour sop and the Cherimoya.

Lastly in considering vegetables, mention is made of sweet potatoes, yams, cassava, and Indian corn. Selection work has been done with these in Cuba but there still remains a good deal to be accomplished, and more attention especially should be given to the selection of Indian corn.

The facts and suggestions embodied in the foregoing article should appeal to those interested in fruit in the British West Indies, and lead to greater attention being given to the production of fruit for local consumption if not for export.

THE BONAVIST BEAN.

Some useful information concerning the bonavist, lablab, or hyacinth bean (*Dolichos lablab*) is given in Bulletin No. 318, issued from the Bureau of Plant Industry of the United States Department of Agriculture. Concerning cultural characteristics, it is pointed out that the bonavist is closely comparable to the cowpea, but that it is more vigorous and more viney. Like the cowpea, the bonavist is indeterminate in growth, blooming and fruiting as long as the conditions remain favourable. In some parts of the tropics one plant of this bean will go on flowering for as long as two years.

This bean is markedly drought-resistant, and in many situations has been found to excel the cowpea in this respect. The bonavist is well adapted to planting with corn or some other supporting crop. The principal weakness of the bonavist, considered as a forage crop, which is the chief American standpoint, is the relatively poor yield of seed, and the difficulty of harvesting the same, which makes it expensive. From a seed production standpoint the most desirable varieties are those in which the pod retains its form when dry, as these are not much affected by wet weather, and thrash out rather easily. It should be noted here that in tropical and sub-tropical countries, the bonavist is grown for human consumption and not for stock feed. The young pods of some varieties may be used after the manner of string beans, while in the West Indies the dried seeds are utilized as food. In connexion with the value of this bean as a human food, it may be stated that tests for prussic acid in both dry and germinated seed failed to reveal evidence of the presence of this poison.

The bonavist in all its parts shows great variation. At the end of the Bulletin some notes are given describing a large number of varieties introduced by the American Office of Foreign Seed and Plant Introductions from 1899 to 1913. This list includes varieties from British Guiana and from Barbados. The Barbados variety is referred to as being very fruitful.

AN ECONOMICAL DIPPING TANK.

The greater appreciation of the importance of dipping live-stock in the West Indian islands that exists at the present time renders of interest an article in the *Rhodesia Agricultural Journal* for October 1915, describing how a dipping tank can be erected cheaply out of home-produced material on the estate. The sides of the tank instead of being lined with expensive concrete are supplied with slabs of rock. It is suggested that this rock material can easily be obtained locally on most estates. The whole of the stone material (except the end of the tank where the cattle enter) may be laid in clay or earth mortar, leaving the joints open facing the tank to a depth of 3 inches to receive the cement pointing. It will be understood that the economy of this tank rests upon this fact—that a minimum amount of cement mortar is employed.

The following figures are given to show the cost of such a tank that was erected on an estate in Rhodesia. In giving the cost, no account for the labour and supervision of the estate manager is given because, it is stated, it is part of the ordinary farm work, and should be compensated for by the improvement of the condition of the cattle through regular dipping. Likewise charges for team work and timber for posts, fencing rails, etc. are omitted. In many islands of the West Indies this could be obtained on the estate at almost negligible cost. The following are the chief items of expenditure:—

	£	s.	d
4 barrels of cement	6	13	0
Transport: 1,600 lb. at 9*s.* per 100	7	4	0
Excavating tank pit: 2 boys, 4 days at 1*s.* per day		8	0
Quarrying rock: 3 boys, 5 days at 1*s.* per day		15	0
Hauling rock: 3 boys, 3 days at 1*s.* per day		9	0
Building tank: 3 boys, 9 days at 1s. per day	1	7	0
Cement pointing: 3 boys, 7 days at 1*s.* per day	1	1	0
Plastering tank: 2 boys, 2 days at 1*s.* per day		4	0
Dressing rock (if care is exercised in selecting rock, only the course facing the tank requires dressing): 2 boys, 2 days at 1*s.* per day		4	0
Building draining pen: 2 boys, 2 days at 1*s.* per day		4	0
Cutting and hauling timber for posts, rails, etc., 3 boys, 2 days at 1*s.* per day		6	0
Spikes for fencing rails: 20 lb. 5-inch nails		6	8
	£19	1	8

COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 10, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report a limited business has been done in West Indian Sea Island cotton. About 130 bales have been sold, which include St. Vincent 16½*d.* to 17*d.*, St. Kitts 15½*d.* to 17*d.*, Anguilla 14¾*d.*, and Nevis 15½*d.*; also Stains 9¼*d.* to 11½*d.*

Prices are firm, but there is no stock.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January, 15, 1916, is as follows:—

ISLANDS. The limited offerings of odd bags were in active demand at prices ranging from 24 to 27c., the buying being on account of the Northern Mills. Several Planters' crops were also sold on private terms for export.

The receipts consist very largely of Planters' crops, which had been previously sold, and were shipped here to be delivered to the buyer.

The unsold portion of the crop consisted chiefly of Planters' crops held on plantations, the odd bags, classing Fine to Extra Fine, having very nearly all been marketed and sold.

We quote, viz.:

Extra Fine	28c. = 18*d.* c.i.f. & 5 per cent.
Fully Fine	27c. = 17½*d.* „ „ „ „
Fine	26c. = 17*d.* „ „ „ „
Fine off in class	25c. = 16½*d.* „ „ „ „

FLORIDAS AND GEORGIAS. With an active demand throughout the week the market was swept of all offerings of all grades, with sales of 2,223 bales, at a further advance of ½c. to 1c. And the market closed strong, with the remaining stock being held for a further advance. There were also large sales made in the interior at full prices.

Whilst the stock is reported at 16,337 bales, it is largely sold, there remaining in Factors' hands not over 2,000 bales, to 3,000 bales.

We quote, viz.:

Fancy	28c. = 29c., landed.
Extra Choice	27c. = 28c., „
Choice	26c. = 27c., „
Extra Fine	25c. = 26c., „

The Exports from Savannah for the week were, 500 bales to Northern Mills, and 193 bales to Southern Mills, and from Jacksonville 831 bales to Northern Mills.

The U.S. Census Bureau reports cotton ginned to January 1 as follows:—

South Carolina 5,587 bales
Georgia 55,531 „
Florida 27,803 „
} Making a total of 88,921 bales

against last year 76,886 bales Total crop 78,857 bales

„	1913	74,320 „	„	85,544	„
„	1912	67,401 „	„	66,169	„
„	1911	106,439 „	„	122,512	„

SEA ISLAND COTTON IN BARBADOS.

The following table, which gives the area of Sea Island cotton grown in Barbados, from January 1 to December 31, 1915, has been forwarded to this Office by Mr. J. R. Bovell, Superintendent of Agriculture, Barbados:—

Parish.	Total area. A.	R.	P.
St. Michael	66	3	0
Christ Church	170	0	0
St. George	1	3	0
St. Philip	697	0	20
St. Thomas	Nil		
St. John	4	0	20
St. Joseph	Nil		
St. James	13	0	0
St. Peter	45	1	20
St. Andrew	4	1	0
St. Lucy	75	3	34
Total	1,078	1	14

THE ANTIGUA AGRICULTURAL AND COMMERCIAL SOCIETY.

The Antigua *Sun* for January 12, 1916, publishes an account of a general meeting of the Antigua Agricultural and Commercial Society, held on the 7th of that month. Reviewing the past year's work, considerable interest was aroused, said the Chairman, in regard to maize cultivation. On the initiative of the late Governor Sir H. Hesketh Bell, K.C.M.G., a granary has been established for the purpose of kiln-drying corn. The working of this is under the direction of a board of management, of which Dr. H. A. Tempany is the Chairman. As to the successful progress of this industry, figures obtained from the Treasury show that a larger quantity of maize was grown than anticipated, resulting in a remarkable falling off of the imports of that article in the past few years. Emphasis is placed on the necessity for giving every encouragement to peasant growers, maize cultivation being an industry which they can well undertake.

The cotton industry is reported to have received a set-back during the past two years, and some dissatisfaction has been expressed by cotton growers in regard to the uncertainty of price, and the long time elapsing between valuation, sale, and remittance of proceeds. In consequence of the War, the price of sugar had been increased, and the sugar made by the Gunthorpes Factory was sold at a price which enabled cane growers to obtain a better figure for their canes. Reference is made to the Antigua Onion Growers Association—'the first baby of the Society'—and its successful working briefly commented on. The co-operative insurance of live-stock and fire insurance was a subject brought before the Society during the year and a scheme formulated for the insurance of cattle and mules against death by accident or disease. This, however, has not yet been brought into operation. Five new members were elected bringing the strength of the Society up to 107. In conclusion, thanks are expressed to the Secretary, Mr. T. Jackson, for the able, willing and courteous work given to the Society; to the Government for the use of the room; and to the Imperial Department of Agriculture through its representative Dr. Tempany, for the help and assistance given individually and collectively. Without the assistance given by Dr. Tempany and Mr. Jackson, it was feared the Society would not by any means be as useful as it was.



FEEDING HUMMING BIRDS.

The *Annual Report Smithsonian Institution*, 1913, reproduces a paper read at the Thirty-first Annual Congress of the American Ornithologists Union, in which experiments in feeding humming birds during seven summers are described. The experiments were begun without intending them to bear upon the question of the food naturally sought by the ruby-throated humming bird (*Archilochus colubris*); the original aim of the feeding was to attract the humming birds about the yard, in the hope that some time they would remain to nest there. The feeding was effected by means of artificial flowers made from white oil cloth, their edges being stiffened with one strand of wire taken from picture cord, and the flowers carefully painted with oil colours, the first to represent a nasturium, and the second a tiger lily. On the appearance of a humming bird about the natural flowers, the artificial nasturium, tacked to a stick was placed near a clump of blooming phlox, and its bottle filled with a syrup made of granulated sugar dissolved in water. The next day, a female ruby-throat was seen searching the depths of tiger lilies that grew north of the house; as she flew to the east of the house she was instantly followed, and was seen drinking from the artificial flower for the space of about a minute, after which she flew to a rosebush, wiped her bill, and rested a brief time before flying away. This was about noon. She returned at intervals of about a half hour for the next three hours; then at 3.10 o'clock she came back to search quite thoroughly the phlox blossoms, this being the first time she had paid any attention to them after finding the syrup. Ten minutes later she drank deeply from the bottle and was seen no more that day.

In this way begun the feeding of the ruby-throated humming bird, which has been continued each summer since 1907 with a varying number of birds. The number of bottles in use has also increased, each new bottle being added by way of an experiment. For instance, the first one was placed in an artificial flower painted to imitate a nasturium, mainly yellow in colour; the second flower in form and colour closely resembled a tiger lily. The experiment with the yellow and the red flowers was to test a supposedly erroneous theory which had been published, to the effect that humming birds show a preference for red flowers. In further proof of the fallacy of this statement the third flower, shaped like the nasturium, was painted green, and was placed in a bed of green plants, which at that time bore no blossoms. It was staked out and filled on August 5, 1909, when no humming bird was in sight, but in about ten minutes some of the species had come, and fifteen minutes later one was drinking from the bottle in this green flower. Bottles filled with syrup but without an encircling flower proved equally attractive.

The last experiment made was that of flavouring one of the bottles of syrup with vanilla, and later with extract of lemon, to see if the birds showed preference for the plain syrup or for the flavoured. Both kinds were served at the same time, and of both the birds drank, showing no choice that could be detected.

THE PRESERVATION OF MEAT.

The perservation of meat by the agency of salt (Sodium chloride) is one of the oldest and most widely used processes. Salt acts partly as a dehydrating agent—that is, it deprives the meat of water—and partially as an antiseptic. In salting meat to preserve it from decay, various methods are employed. Some preservers adopt one method, some another. In order that any process may be successful, attention must first of all be directed to the slaughtering of the animal whose carcass it is intended to preserve. A cool day should he chosen for the slaughtering; the animal should be well bled, and, after having been carefully dressed, the carcass should be allowed to hang in a cool place until the animal heat has dissipated. This condition is indicated by the carcass setting firmly. After the carcass has set it should be cut up.

There are various ways of salting meat, and any of the following will give successful results:—

1. For each 100 lb. of meat, employ a thoroughly incorporated mixture of 8 lb. of Black Horse salt, 3 lb. of granulated sugar, and 4 oz. of saltpetre. Rub the meat to be treated on all surfaces with one-third of the mixture, and then pack it in a barrel. Let it remain there for three days; then take it out, rub it again with another one-third of the salt mixture. In putting the pieces back into the barrel, place those that were previously on top at the bottom of the vessel. At the end of another three days take the meat out again, and rub it with the last one-third of the mixture. Three days after this the meat will be cured. Now take it out of the barrel, place it on a board over the barrel, and allow it to drip into the barrel for a day or two. It can be used when partially cured, as occasion demands, at any point previous to this stage, if the preserver so wishes. If it is now required to keep the meat still longer, it should be rubbed over with a little dry salt, and when dry it should be smoked. The process of smoking greatly assists in the preservation of meat, partly on account of the drying action of the heat associated with the smoking, and partly through the antiseptic action of some of the substances in the smoke. The best substance to use to make a dense smoke is the finest New Zealand pine sawdust (Kauri pine). The preservation of the meat in hot weather is also greatly assisted by adding to the brine, formed during the process, a little sodium sulphite. Add for every 100 lb. of meat half an ounce of sodium sulphite to the brine. The liquid that is found in the barrel during the process should not be removed, but the meat should be repacked in it each time it is taken out from it.

2. A second method consists of placing the meat in casks in layers, with salt between each layer. The salt withdraws water from the meat, and the brine that is formed penetrates the substance of the flesh.

3. A third method consists in pumping a strong solution of salt, by means of a brine pump, into the arteries. This method has been demonstrated to butchers, and is a rapid and effective way of preserving meat.

Any farmer, however, can employ methods No. 1 and No. 2; and, if he treats fresh flesh on a cool day as directed, he will get successful results. The use of water in making a pickle should be avoided, since the water-supply on a farm is usually contaminated with micro-organisms that rapidly cause putrefactive changes in flesh. If, however, curing by brine is desired, about $3\frac{1}{4}$ lb. of salt should be added to every gallon of water, and the water should have previously been boiled. The brine made on adding the salt to the boiled water should be filtered through a double fold of cheese-cloth, to remove various impurities. The pickling barrel should be kept in a cool, well-ventilated place.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number refers to the question of the measurement of soil tilth by means of an appliance of which we publish an illustration.

Several articles appear in this issue concerning fruit and fruit products, including cacao and coco-nuts.

An illustrated article will be found on page 63, describing a parasite of the flying fish.

Insect Notes, on page 58, deal with grasshopper control; under Plant Diseases, on page 62, appears an article on the spotting of oranges.

Dutch Observations on Transpiration in the Sugar-cane.

Nos. 44 and 45 of *Archief voor de Suikerindustrie in Nederlandsk-Indië* for November 1915, contain two interesting papers concerning stomata and transpiration in the sugar-cane. The first paper states that, as might be expected, the stomata open in direct sunlight and close in complete darkness. In very weak light they slowly become partly open, and retain a small opening during a long sojourn in such light. High temperature causes the opening of the stomata even in the dark, provided that the plant does not remain in the dark too long. The influence of atmospheric moisture is not established with certainty: probably a high degree of humidity is favourable to the opening of the stomata. When the plant is fully saturated with water the opening is bigger.

The observation that the stomata remains open in direct sunlight, presumably during the hot hours of the day, is of interest in connexion with W. L. Balls' observations in regard to the leaves of cotton, of which the stomata were found to close during the middle hours of the day.

The second paper furnishes conclusions of a more definite kind.

The author found it convenient to work with cut stems: their use is considered far preferable to that of pot plants. It would seem, however, that the use of this material is open to objection when one comes to apply the results obtained to sugar-cane plants growing under field conditions. As regards the conclusions arrived at, it is stated that different varieties of sugar-cane show themselves to differ as regards the amount of evaporation at various hours of the day. Those forms give the highest cane production in which during the first hours of the day the evaporation is strongest, with a rapid falling off afterwards. Thus, not the kinds which retain about the same stomatal opening the whole day, but rather those in which the opening becomes smaller relatively early. In general, transpiration and stomatal opening run parallel. Nevertheless the maximum of transpiration generally comes after the maximum of opening is already passed. The number of stomata is of lesser importance in relation to the amount of evaporation.

It would appear from the above that the author regards a variety's capacity to regulate transpiration as being correlated with cane production. In connexion with this regulation of transpiration the author makes no reference to the varying anatomical structure of cane leaves which is responsible for the various curling phenomena that must help to check the loss of moisture under field conditions.

The second paper is composed of the following sections: (1) methods and material, (2) comparison of certain varieties, (3) the relation between stomatal opening and transpiration, (4) comparison of cut stems with plants in the ground, (5) influence of intensity of light on transpiration, (6) the relation between the amount of transpiration and the number of stomata.

In connexion with the last section, reference is made to a paper on the stomatal characteristics of varieties of sugar-cane which appeared in Vol. XIII of the *West Indian Bulletin*.

An Efficient Central American Republic.

Sir Sydney Olivier, late Governor of Jamaica and now Permanent Secretary to the English Board of Agriculture, delivered an interesting lecture on November 30 last, before a meeting of the Royal Society of Arts in London. His remarks upon Jamaican labour in Central America were particulary interesting. In 1911, Sir Sydney stated, there were no less than 40,000 Jamaicans working in Costa Rica alone. This republic has had a remarkable development, the result entirely of commercial enterprise. The speaker's description of the republic explained the reason why. 'Costa Rica is a most efficiently organized industrial republic under the absolute, though very enlightened, and benevolent despotism of the United Fruit Company. The development in Costa Rica of great banana cultivations, the building of railroads and steamships to carry the fruit internally and externally have been entirely the work of the United Fruit Company. And not a small proportion of the prosperity of Jamaica itself is due to the operations of the same corporation.

Two New Local Publications.

'The Feeding of Stock' is the title of a short pamphlet issued by the St. Kitts-Nevis Department of Agriculture. Part I, on the composition of feeding, stuffs is by Mr. H. Waterland, the Chemical Assistant, and Part II, on the general properties of feeding stuffs and on rations, is by Dr. Shannon, Government Veterinary Surgeon. In this second part, the remarks concerning French weed (*Commelyna* sp.) and the sweet potato vine as fodders appear to show that the former is as good as Guinea corn fodder, while the latter might be more generally used for the feeding of milch cows. Greater attention ought to be given to the curing of cane tops in St. Kitts. Analyses of these different native fodder plants are provided, but the digestibility co-efficient is not worked out. On the whole, stock owners in St. Kitts ought to find this little treatise very helpful.

In another local publication, this time from St. Lucia, Mr. A. J. Brooks, the Agricultural Superintendent, shows in a practical style how manuring should be carried out in that island with particular reference to the maintenance of organic matter and the treatment of exhausted soils. Great emphasis is laid upon the utilization as manure of all the crop residues which can be put to no better purpose. The leaflet is written for the peasants and as such will, on account of its simplicity and directness, serve a useful purpose.

Domestication of Fancy Plumage Birds.

Concerning our note on this subject in the last issue of this Journal (p. 41), which dealt with egrets and ostriches, it is interesting to learn from the *Journal of the Royal Society of Arts*, that with a view to encouraging the breeding of egrets as a private industry in Madagascar, the Governor-General of the Colony has extended for three years from May 3 last the interdiction of the shooting of egrets and false egrets, 'vorompotsys.' The raising of egrets and 'vorompotsys,' and the sale of the plumes gathered from domesticated birds, are authorized under certain conditions. According to a report by the United States Consul at Tamatave, breeding should commence with young birds only, whose capture is authorized at the age of ten to forty-five days. The capture of full-grown birds is forbidden. The authorized capture of young birds, etc., does not extend to Green Island and the islets of the Vohemar Bay, which are reserved as producing centres of the Vohemar administrative egret farm.

As we stated, on the authority of Dr. Deurden, the South African ostrich specialist, there are possibilities before the domestication of fancy plumage birds in the West Indies, just as there are possibilities in the matter of organizing and developing West Indian fisheries, especially shallow-water fisheries like sponging and turtle and oyster rearing.

It is only the resources of the soil that have been tapped in these islands, and even these have not yet been fully exploited, as a visit to Trinidad, St. Lucia or Dominica will readily show.

Report on the St. Vincent Agricultural Credit System.

The Administrator of St. Lucia has forwarded to this Office a copy of a report by the Inspector of Agricultural Credit Societies of St. Lucia on the system now operating in St. Vincent. It will be remembered that an Agricultural Credit Ordinance has recently been passed in St. Lucia, and it is intended to introduce into St. Lucia a similar system of credit to that existing in St. Vincent where societies have now been established for some time.

The report does not give any very detailed information, but it appears that a satisfactory impression of the working of the system was formed. Much of the success in St. Vincent depends upon the confidence placed by the peasants in the Agricultural Officers. Importance attaches also to the co-operative sale of produce, and in this connexion there might be an extension to include St. Lucia.

The report includes a specimen page of No. 3 of the Societies' books, which comprise (1) Cash Book, (2) Ledger, (3) Loan Book, and (4) Minute Book. The Registrar keeps a Register of all Societies registered under the Ordinance. It is hardly necessary to state that close land settlement under Government supervision is a great help to the successful conduct of credit societies. It is in this respect that St. Vincent has an advantage over other islands in the West Indies.

INSECT NOTES.

GRASSHOPPER CONTROL.

An account is given in Bulletin 293 of the United States Department of Agriculture, of the grasshopper outbreak in New Mexico during the Summer of 1913. The section of this Bulletin dealing with artificial remedies is reproduced below, as being likely to be of interest to West Indian planters during the next few months, when the grasshoppers may be expected to be numerous and injurious to cane and other cultivated crops.

The poison bran bait in which fruit juices are used has been mentioned in previous numbers of the *Agricultural News*. The directions for preparing and using the Criddle mixture were also given in the columns of this Journal, but as this was some time ago, they also are reproduced below.

ARTIFICIAL REMEDIES.

'The most effective artificial means of exterminating the grasshoppers of this species was found in the use of the poisoned bran mash. This was made as follows: Thoroughly mix together in the dry state 25 lb. of wheat bran and 1 lb. of Paris green. Into a separate receptacle containing 2 quarts of a cheap molasses or syrup add the juices and finely ground skin and pulp of three oranges or lemons. Dilute the molasses mixture in 2 gallons of water and add to the poisoned bran mixture. Thoroughly mix the two together, adding enough more water, if necessary, to bring all to a stiff dough. This amount of poisoned bait will treat from 5 to 10 acres.

'The bait should be sown broadcast early in the morning before sunrise, in strips 1 rod apart, over the area to be treated. The most satisfactory method of distributing the bait is to sow it from the rear end of a buggy.

'In using the poisoned bait as above, with lemons as the fruit employed, tremendous numbers of the grasshoppers were exterminated. As many as 75 dead grasshoppers per square foot were frequently found, several days after the application, over large areas. The grasshoppers usually die from 6 to 80 hours after taking the poisoned bait into the system.

'Coarse-flaked brans should be used in preference to the fine-flaked varieties. Only those brands of Paris green which are guaranteed to contain not less than 55 per cent. of arsenic should be employed. Arsenate of lead should not be used in any form. There have existed some differences of opinion as to whether oranges or lemons make the bait more effective. As 75 per cent. of the efficiency of the bait is attributed to the use of these citrus fruits, this point is naturally a very important one. The writer, in extensive experiments with different species of grasshoppers, has yet to note any material advantage or marked difference of efficiency in favour of either oranges or lemons.

'The Criddle mixture, as commonly employed in grasshopper extermination, was not experimented with during the present investigation for lack of available material. But as nymphs of this species are voracious feeders on horse droppings and dried 'cow chips,' there seems little question but what this bait could be effectively used if the ingredients were readily available.'

THE CRIDDLE MIXTURE.*

'What has come to be known as the "Criddle mixture" is giving most satisfactory results in dealing with grasshoppers on the ranches of both the United States and Canada. The mixture is composed of half a barrel of fresh horse droppings in which is mixed a pound each of salt and Paris green. If the horse droppings are not fresh the salt is dissolved in water and mixed with the manure and poison. When this mixture is scattered freely about where the grasshoppers are abundant, they seem to be attracted to it, for they devour it readily and are poisoned thereby. Dr. James Fletcher, Entomologist for the Dominion of Canada, cites an instance where this mixture had been scattered freely around the edges of a field, and states that this particular field stood out as a green patch in a brown plain, as it was situated in the midst of fields where nothing had been done to destroy the grasshoppers. The "Criddle mixture" now seems preferable to the poisoned bran remedy that has given, and still continues to give, beneficial results, for it is less expensive than the latter, and less likely to poison other animal life.'

H.A.B.

*See *Agricultural News*, Vol. VII, p. 202.

SCHOOL GARDENS IN BRITISH GUIANA.

The matter of greatest interest to readers of this Journal in the report of the Director of Primary Education in British Guiana for 1914-15, is that concerning agricultural education. This principally deals with school gardens. It is stated that there are well over 100 of these attached to the primary schools in every part of the Colony. The number of them has not varied much in recent years, so that the probability is that nearly every school, having available land suitably situated, has its garden. There used to be eight Government model gardens in British Guiana, but these have been closed by decision of the Combined Court, which has decided not to vote the necessary money for their upkeep. These gardens have served for many years past as models to the agricultural community resident within a radius of several miles around them; and they have also been utilized as practising schools for the instruction, at regular intervals, of boys and girls, by trained instructors of the Department of Science and Agriculture, on the principles underlying a sound knowledge of scientific agriculture. By closing down these model gardens, the report says it is greatly to be feared that any further progress in the direction of agricultural education will be seriously impeded.

The agricultural officers occasionally visit the ordinary school gardens, and thus afford material assistance to the teachers in the laying out and maintenance of their gardens, and to the inspectors in arriving at a fair judgment of the grant to be awarded at the annual inspection. The Report continues:

'The chief faults that the Agricultural Officers report in respect of the School Gardens are that in many cases the drains are grassy; the beds and drains not well regulated or shaped; and the general cultivation of the beds neglected, overgrown with weeds, or not sufficiently varied. Again in some instances, the general condition of the garden is either unsatisfactory or bad; while in a few schools the officers recommended that the gardens should be discontinued. On the other hand, it is gratifying to note that the condition of some School Gardens is reported, at the time of the visits of the Agricultural Officers, to be either "fair," "good," or "very good".'

'One of the changes introduced by the new Code is that the garden grant is no longer restricted to the pupils of the three Higher Standards. Every boy between the ages of nine and fourteen is now eligible to receive instruction in garden operations, irrespective of the class or standard in which he is working, but, on the other hand, this grant ceases to be available for girls. The maximum grant, however, is now $1·20 per pupil, whereas under the previous Code it was $1·00.'

AGRICULTURE IN NEVIS AND TORTOLA.

Two quarterly reports dealing with agricultural conditions in Nevis and Tortola have been received recently, and the following consists of the more interesting points referred to therein.

In Tortola the principal work towards the end of last year was the raising and distribution of onion seedlings at the Experiment Station. The number distributed between November 15, and December 31 was about 192,000. The establishment of the fields, however, was interfered with by dry weather, and an attack of insects. The cotton seed farm, established with a view to supplying the island with selected seed, received a considerable amount of attention, but the crop suffered on account of the weather and the vigorous attacks of cotton worm. The cotton industry, as a whole, was naturally depressed through the war, but the price paid for best grade cotton brought in by the peasants has been increased from 5c. to 7c. per lb., as from the commencement of the present buying season. This increase will tend to restore confidence.

Attention has been given to work in the coco-nut demonstration plots, and the scheme in view has now been completed.

In forwarding the above information, Mr. W. Fishlock, the Curator, regrets to have to record the death of Mr. Charles Maduro, one of the most useful of the station employees. His death took place after a very brief illness on the evening of December 31. The deceased had rendered faithful service at the Station for over eight years.

The quarterly report from Nevis deals chiefly with the condition of the principal crops growing at the Station, and on the estate. The cane crop throughout the island was at the time of writing very promising. A good crop is anticipated. In some parts of the island the growers are disappointed at not being able to get their canes sold at the St. Kitts factory. Sugar is being made on some estates, but the machinery is not very good, and it pays better to sell the canes to the factory. The cotton crop this season has not been very good, and the return per acre, on the average, must be low. However, the cotton demonstration plot at the Station, which was reaped during the quarter ending December 31, gave a return of 660 lb. of seed-cotton to the acre as a first picking, which was not bad, considering the circumstances that prevailed. The plot of onions at the Station has done fairly well and the plants are now forming bulbs. A supply of crates has already been bought, as it is intended to make a shipment to New York and try and establish a market there for Nevis. The following plants, seeds, etc., were distributed from the Station during the quarter: 12,500 sweet potato cuttings; 750 cassava cuttings; 1,300 lime plants; 18 ornamental plants; 46 lb. of Guinea corn; 13 lb. of cotton seed; and 23 lb. Paris green.

We gather from a statement received from the British Cotton Growing Association comprising a list of West Indian cotton on hand, unsold at December 31, 1915, that with the exception of St.Vincent, practically the whole stock of Sea Island cotton had been disposed of. The foregoing information would appear to indicate that satisfactory conditions obtain in the Sea Island market. The stocks referred to were last season's crop. Delay has occurred in the shipment of this season's, but will soon arrive in big consignments. It will be interesting, in view of the recent rise in prices, to see what the effect will be on the Liverpool market.

ST. VINCENT ARROWROOT GROWERS ASSOCIATION.

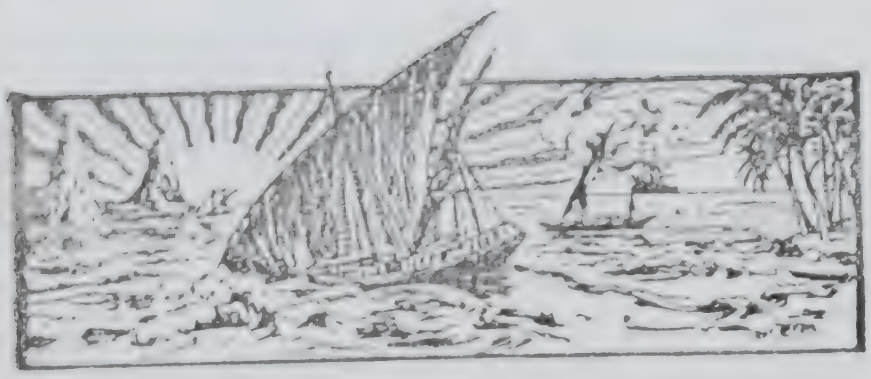
The Annual Report of this Association for 1915, which has recently come to hand, shows that while the finances are in a sound state, the activities of the Association have been hindered on account of the war. This applies particularly to the Association's advertising campaign It had been intended to enter upon a scheme for introducing into the United Kingdom a proprietary article of food in the preparation of which St. Vincent arrowroot would be largely used. Although it was arranged that the cost of this project would not exceed £400, it was decided that owing to unsuitable conditions resulting from the war, it would be wise to defer the commencement of the campaign until a later date. Similar intentions were entertained regarding Canada, but for similar reasons failed to materialize As regards production of arrowroot in St. Vincent itself, the industry is in a favourable condition. Many members have recently improved the quality of their product. Progress is still the watchword; and although curtailment of production is at present proceeding owing to the exigencies of the industry, the island is capable of doubling its yield of arrowroot, if that be necessary to meet any demand that might be created on both sides of the Atlantic when the war is over.

On account of the increase of freight rates, a special meeting was held during the year at which it was resolved that the increased cost of shipment should be borne by the consumer, as the market prices then obtaining for the various grades of arrowroot were on such a level as would not admit any further decrease in prices paid to members of the Association. Accordingly it was agreed to raise the minimum price of arrowroot of all grades by the sum of $\frac{1}{4}d.$ per lb.

Blue Mountain Coffee: A Correction.—In the article on Blue Mountain Coffee which appeared in the *Agricultural News* of September 25 (Vol. XIV, p. 308), certain mistakes occur on account of some difficulty experienced when deciphering the manuscript on which the said article was based. In line 10 from top of page 308, right hand column, the word *Priage* should read *Triage*. Again, the statement 'twenty-nine of which are a mule load.' should read 'two' instead of 'twenty-nine.' Further, the reference to irrigation of Blue Mountain coffee is out of place, since irrigation in regard to the cultivation of crops on Blue Mountain lands is impossible.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Wednesday, February 9, by the C.R.M.S. 'Chaudiere' from Antigua, after an official visit to that Colony.



GLEANINGS.

According to information received from the Experiment Station, Tortola, the return of lime juice shipped from that Dependency during the period October 1 to December 31, 1915, was 13 casks, equal to 520 gallons, estimated at a value of £120. Presumably concentrated juice was shipped.

Some physiological work on the sugar-cane, conducted in Brazil, is noted in the *Experiment Station Record* for October 1915. Results are reported on a microscopical study of the development of the bud of sugar-cane, showing the distribution of glucose, starch, tannic acid, and albuminoids in the growing plant.

It is stated in the *Experiment Station Record* for October 1914, that a substance called nitro-benzol is usually added to ground nut oil for the purpose of giving the oil a pleasant odour, and deceiving the public into thinking that the product is oil of bitter almonds. A method of determining the presence of the substance is referred to.

Concerning the culture of rice in California, *Farmer's Bulletin* No. 688 of the United States Department of Agriculture, states that clay soil with an impervious subsoil, if it lies in level tracts and can be well drained, is well adapted to rice. Shallow soils are preferable to deep soils, because less water will be required to submerge them.

The *Philippine Journal of Science*, Vol. X, Section A, No. 2, contains two interesting papers, one on the enzymes of cacao, and another dealing with ylang-ylang oil standards. Unfortunately the copy of the journal under notice is an imperfect one, several pages of the paper on the enzymes of cacao being absent. It is intended to publish a summary of this important cacao paper as soon as a complete copy has been received.

A year or two ago reference was made to the ginger lily (*Hedychium coronarium*) as a new material for paper-making. Another and more recent introduction is Zacaton grass of the genus Epicampes. It is a Mexican species. In *Bulletin No. 309*, Bureau of Plant Industry, United States Department of Agriculture, it is stated that the grass can be less expensively employed for paper-making than poplar wood. Paper manufactured from this stock has shown physical tests equal to those of a first-grade machine-finished printing paper.

The position and progress of the planting industry in the Nyasaland Protectorate are dealt with by the Director of Agriculture, Mr. Stewart McCall in his Annual Report for the year ending March 31, 1915. The most notable development of the year was the extension and improvement of tea-growing prospects in the Mlanje district, several consignments having realized the satisfactory price of 1*s.* per lb., which compares favourably with similar tea from the established tea estates of the East. It is noticed that there has been a gradual abandonment of Ceara rubber plantations in Nyasaland.

The British Government has prohibited the export of logwood from the British West Indies. This has led to the appearance of articles on the subject in the *West India Committee Circular*, and in the New York *India Rubber World*. Financially it appears that the West Indies, notably Jamaica, will suffer; while the want of the material will be severely felt in the United States. It is hoped by the journals in question that some more equitable readjustment may be effected. At the same time it has to be agreed that British requirements must at the present juncture have first consideration.

In *The Board of Trade Journal* for December 1915, it is stated that a law is to be passed in Colombia providing for State encouragement in the matter of cultivating the mulberry tree, the breeding of silkworm, and the spinning of silk for the requirements of textile manufacturers abroad. Provision is made for the appropriation of about £2,000 annually, to be distributed amongst the various Departments of the Republic, and used for the foundation and maintenance of schools of sericulture, the purchase of spinning machines, and the payment of premiums to producers of silk and cultivators of the mulberry tree.

In the monthly report of the Agricultural Instructor, Grenada, for December 1915, forwarded to this Office by His Excellency the Governor, it is observed that the general condition of the crops in the Experiment Plots on the settlements at Westerhall and Morne Rouge was satisfactory. The limes at Westerhall have improved considerably during the past three months: those at St. Cyr Mountain Settlement are making good growth, while the crop at Morne Rouge is practically over. Considerable progress has been made in the planting of beans on the Settlements, and it is stated that the coco-nuts show a good appearance.

Oil-mixed Portland cement concrete is the subject of a note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for November 1915. Concrete and mortar containing oil are almost perfectly non-absorbent of water, and are therefore excellent materials for damp-proof construction. The addition of oil, however, does not increase to any great extent the impermeability of concrete subjected to heavy water pressure. The bond between concrete and plain bar reinforcement is decreased by the use of oil, but when deformed bars, wire mesh or expanded metal is used there is no apparent decrease.

THE CURING OF BACON AND HAMS.

The production of pork and bacon is now receiving attention in the West Indies. In the last issue of this Journal we published a recipe for dry-salting bacon and hams. We now reproduce from Mr. Thomas Allens' 'Profitable Pig Breeding and Feeding' a few recipes for the curing of bacon and hams. On another page in this issue will be found a general article on the preservation of meat.

A two-year-old smoked ham from a 12-score dairy-fed young pig, cured after the following old-fashioned Suffolk recipe, would find a ready sale. The recipe can be used for tongues as well as for bacon and hams. Take 3 lb. of coarse dark sugar, 1½ lb. of common salt, 1 lb. of bay salt, 3 oz. of saltpetre, 3 oz. of black pepper. Mix the above together. Rub the meat well the first day. Baste and turn every day for the first week and every other day the following three weeks, making one month in all. Let the meat drain after removal from the pickle, and be well dried before smoking. The above quantities are for two large hams, two cheeks, or the equivalent in bacon. The proportions are, of course, adaptable to larger operations.

A. W. Fulton in his 'Home Pork-making' gives the following directions for the treatment of hams and shoulders: 'To each 100 lb. of meat use 7½ lb. of fine salt, 1½ lb. of granulated sugar, and 4 oz. of saltpetre. Weigh the meat and the ingredients in the above proportions, rub the meat thoroughly with this mixture, and pack closely in a tierce. Fill the tierce with water, and roll every seven days until cured, which in a temperature of 40° to 50° would require about fifty days for a medium ham. Large hams take about ten days more for the curing. When wanted for smoking wash the hams in water or soak for twelve hours. Hang in the smoke-house and smoke slowly for forty-eight hours, and you will have a very good ham.'

Another method of pickling preparatory to smoking includes the use of molasses, as follows: 'To 4 quarts of fine salt and 2 oz. of pulverized saltpetre add sufficient molasses to make a pasty mixture: 2 lb. of brown sugar will do as well as the molasses. The hams, having hung in a dry, cool place for three or four days after cutting up, are to be covered all over with the mixture, more thickly on the flesh side, and laid skin side down for three or four days. In the mean time make a pickle of the following proportions, the quantities here named being for 100 lb.: coarse salt, 7lb.; brown sugar, 5 lb.; saltpetre, 2 oz.; pearl ash or potash, ½ oz., soft water, 4 gallons. Heat gradually, and as the scum rises, remove it. Continue to do this as long as any scum rises, and when it ceases allow the pickle to cool. When the hams have remained the proper time immersed in the mixture, cover the bottom of a sweet, clean barrel with salt about ½-inch deep. Pack in the hams as closely as possible, cover them with the pickle, and place over them weights to keep them down. Small hams of 15 lb. and less, also shoulders, should remain in the pickle for five weeks; larger ones will require from six to eight weeks, according to size. Let them dry well before smoking.'

THE WORKING AND MAINTENANCE OF STEAM BOILERS.

Residents in the West Indies who are connected with sugar factories, will be interested in a short article appearing in *Nature* for December 23, 1915, on the working and maintenance of steam boilers. It is stated that lack of proper attention to minor defects, which should be remedied as soon as detected, may greatly increase the fuel bill and shorten the life of a boiler. Reference is made to mechanical stokers as being of special interest, and it is stated that while scale and, to a certain extent, grease, may be tolerated in hand-fired boilers, every effort should be made to remove these injurious substances if increased economy is aimed at, by the adoption of mechanical stokers.

'From an economical point of view it is more important to keep the boiler heating surfaces free from tarry matter than to remove the scale from the interior surfaces: the wear and tear question, however, demands that the inside of a boiler should be kept clean. Scale and grease hinder the heat which enters the plate from passing into the water. The radiating power of incandescent fuels, or flames, increases as the fourth power of the temperature, hence the boilers which have worked satisfactorily but inefficiently, with a comparatively low furnaced temperature, even though the plate may be covered with scale or grease, are likely to be troubled if the furnace temperature, and with it the efficiency, are increased. It is not strictly true to say that scale and grease reduce the efficiency of a boiler; they merely make it unprofitable to adopt an efficient system of combustion.

'Slow bulging of the furnaces may be caused by the deposition of scales of crystals from any boiler water containing more than 4 per cent. of soluble salts. It is more than probable that plates which on one side are exposed to an intense heat, are on the other side covered chiefly with bubbles, and sprays of burst bubbles, which leave their dissolved salts on the boiler plate while the water is evaporating. If the intense heat and rapid evaporation can be maintained, crusts of salt will form here and there on heating surface. Sometimes they will be washed away, but sometimes they will remain sufficiently long to cause overheating. As soon as the little bulging has been effected the salt crust will doubtless break off, but as bulges are exposed to the flames more than other parts, salt crusts are likely to reform in them, and gradually the bulge grows larger and larger until it is detected. As soon as the fire is drawn, the salt crusts are dissolved away, and the bulges are said to be due to mysterious causes. This danger is naturally greatest with boilers having a bad circulation.'

Bulletin No. 5, General Series, Department of Agriculture, Mauritius, deals with the fibre industry of that Colony. Fibre plants in Mauritius are locally called 'aloes', and two varieties occur, namely, the 'Creole aloe'—*Furcraea gigantea*, var. *Willemetiana*—and the 'aloe Malgache', *Furcraea gigantea*. The Creole aloe which is the Mauritian form of *F. gigantea* differs from the specific form by possessing more spines along the lower portions of the leaf edges, by having a terminal spike to the leaf, and by possessing a well defined constricted leaf base. The leaves are usually less pulpy than those of *F. gigantea* and are, on the average, shorter in length. The colour of the leaves of the Creole aloe is almost yellowish green.

PLANT DISEASES.

SPOTTING OF ORANGES.

Some two years ago information was received by the Imperial Department of Agriculture of the prevalence on an orange estate in Dominica of a form of fruit spot which was believed by the grower to have some connexion with subsequent rotting of the fruit in transit.

Specimens of the affected fruit were examined by the writer, and a report made, of which the following is a portion:

'The spots in question are roundish, and mostly about 1 cm. in diameter. They are slightly depressed, and more or less browned. Close examination shows that the superficial tissue occupying the spaces between the oil glands has sunken somewhat and turned brown, while the latter being unaffected stand out from the surface of the spot as small green and yellowish papillae.

'Sections of the rind showed that the cuticle was usually intact. In the fresher-looking examples scattered cells of the epidermis had turned brown, and some amount of the sub-epidermal tissue was brown and shrunken. It is the shrinking of the tissue which is the immediate cause of the spots. In examples in which the injury was either older or more severe, cork formation more or less complete according to the apparent age of the lesion was cutting off, or had cut off, the injured tissues.

'No fungus or bacterium was found in association with the spots. Fungi of the types composing the usual "black blight" were present to a small extent and mostly in incipient stages all over the rind, but were not more especially developed on the brown spots in any constant degree. In the cases where there was an increase it was not more than would be accounted for by the effect of the depressions in arresting spores and retaining a little moisture.

'Oranges bearing the spots have been kept under observation for seven days, some exposed in the laboratory and others in moist chambers. In neither case has any alteration in the appearance of the spots taken place. On the whole, the oranges have kept reasonably well. A few of those which were exposed rotted early, the rest are still sound. Most of those in the damp chambers are now beginning to rot. Again in neither case is there any reason to associate the rotting with the spots in question. One orange with two spots kept in a moist chamber in association with rotten oranges covered with spores eventually developed mould at the stem scar while the spots were still unaffected.

'Experiments in producing spots artificially showed that a similar appearance could be brought about by pricking the rind; this caused the sub-epidermal tissue to dry up.

'The actual cause of the spots could only be ascertained by study of the oranges on the trees. Repeated thorn pricks, sun scald, or the feeding of a large sucking insect may be suggested as possible origins.'

A note by Mr. H. S. Fawcett in the Californian *Monthly Bulletin* for September 1915, p. 434, describes spots with the same characteristics as occurring on lemons and oranges in the California packing houses, where they are known as 'green spots'. They may later turn reddish or brownish. The grade of the fruit is lowered owing to the effect on its appearance, but the keeping quality is usually not seriously injured.

The interest of the note lies in its suggestion of the cause of the blemishes. It has been found that a very small amount of the essential oil of the rind, if it escapes on to the surface of a green fruit, is capable of producing, even on an uninjured area, the typical spotting.

It has been noticed that green fruits picked while wet were more liable to develop spots than those picked the same day when dry, and the same difference was found between fruits kept in jars with moist air and those kept in dry air.

The same type of spot is noticeable to various extents on oranges from neighbouring islands marketed in Barbados. It would appear that the conditions in Dominica, owing to the humidity of the atmosphere, are especially favourable to the development of the spots.

Great stress has been laid by all competent authorities on the need for care in picking and handling citrus fruit intended for sale, and this discovery emphasizes such advice by showing that the most minute injury may lead to a very noticeable blemish.

W.N.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of December:—

The last month of the year started with a fair amount of business being transacted in both drugs and spices. Large quantities of most of the articles were brought forward from week to week during the period under review, the first auction being held on December 2, and the last on the 30th. The usual slackness on the approach of the Christmas and stock-taking seasons was apparent, but not so acutely marked as in ordinary years. Prices generally have been very firm for all the products that come under our notice, and with the increased rates of freightage there seems to be no prospects of a reduction.

GINGER.

At the beginning of the month there were no offerings of Jamaica, but Sierra Leone was quoted at 29*s.* per cwt. At auction on the 22nd, it was reported that the stocks of Jamaica were small, 60*s.* to 67*s.* 6*d.* per cwt. being quoted for ordinary to medium, and 67*s.* to 75*s.* for good to fine.

NUTMEGS AND MACE.

At auction on the 8th of the month, 596 packages of West Indian nutmegs were offered and sold, 69's to 76's fetching 10*d.* to 1*s.*, and smalls 4½*d.* to 5¼*d.*, being an advance of 1*d.* to 1½*d.* on previous rates. At the same auction 232 packages of West Indian mace sold at 1*s.* 4*d.* to 1*s.* 10*d.*, being 1*d.* advance on previous rates.

SARSAPARILLA.

At the first drug auction on the 7th of the month, sarsaparilla was in good supply as follows: Grey Jamaica 22 bales, native Jamaica 57 bales, Lima 35, Mexican 22, and Honduras 7 bales. Of the grey Jamaica, 11 bales found buyers at 1*s.* 8*d.* per lb. for fair, and 1*s.* 7*d.* for part coarse and slightly mouldy. Only 7 bales of the native Jamaica were disposed of, 8*d.* to 9*d.* being paid for inferior yellow dull red, part of which was sea-water damaged. The Lima-Jamaica, which was more or less damp and mouldy, was bought in at 1*s.* 8*d.* per lb. No buyers were found either for the Mexican or Honduras.

CITRIC ACID, LIME OIL, LIME JUICE, KOLA, CASHEW NUTS, TAMARINDS, PIMENTO, AND ARROWROOT.

Citric acid commenced with a very dull market at 2*s.* 9*d.* to 2*s.* 10*d.*, and at the end of the month it dropped to 2*s.* 8*d.* with very little demand. There was also very

little demand for lime oil, but towards the end of the month some sales were effected for West Indian distilled, at from 6*s.* 3*d.* to 6*s.* 6*d.* per lb., and at the last auction it had dropped to 5*s.* 6*d.* to 6*s.* There was a slack demand for lime juice at the beginning of the month, but about the middle, good bright Jamaica was to be obtained at from 2*s.* 6*d.* to 2*s.* 9*d.* per gallon. There was no demand for West Indian concentrated juice. Kola nuts were in abundant supply at the first drug auction on December 2, as many as 122 packages being offered, 46 only finding buyers. They were from various countries, thus a package of fair St. Lucia fetched $4\frac{3}{4}d.$ per lb., while a bag of sound African quarters realized $6\frac{1}{4}d.$ per lb., and mouldy African, part of which was wormy, were disposed of at from $2\frac{1}{4}d.$ to 3*d.* per lb. One bag of small Java sold at 3*d.* per lb., and 1 package of dull Ceylon halves at $4\frac{1}{2}d.$ Seven packages of West Indian kola were again brought forward at auction on the 9th, and disposed of at from $4\frac{1}{4}d.$ to $5\frac{1}{4}d.$ per lb. At the auction on the 16th of the month, the large quantity of 154 packages of cashew nuts from Bombay were sold without reserve, at from 37*s.* to 46*s.* for slightly sea-damaged; for slightly wormy, 32*s.* to 35*s.* 6*d.* was paid. The quotation for West Indian tamarinds during the month has been 18*s.* 9*d.* per cwt., Barbados being specialised at 20*s.*, duty paid. The quotations for pimento towards the end of the month were $2\frac{1}{4}d.$ to $2\frac{3}{4}d.$ for fair to good, and for ordinary to middling $2\frac{3}{8}d.$ to $2\frac{1}{2}d.$; for St. Vincent Arrowroot $2\frac{5}{16}d.$ to $3\frac{3}{16}$ per lb.

THE FEATHERS OF THE FLYING FISH.

Dr. W. T. Calman, of the British Museum (Natural History), contributes to the current issue of the *West Indian Bulletin*, a note describing a parasite of the flying fish, popularly called by the name of 'feathers'. The specimens, which formed a fine series, were collected and preserved by Mr. W. Nowell, Mycologist to this Department, and were forwarded to Dr. Calman by the Imperial Commissioner.

The parasite belongs to a family known under the biological name of Lernaeidae, which includes some of the most highly modified of all the fish lice, the adults having lost—so far as naked-eye appearances go—every trace of crayfish-like or Crustacean structure, and resembling in form the worms with which they were classed by the older naturalists. In the case of the flying fish, the parasite may be attached to almost any part of the body, and appears as a dark-coloured worm-like object about $1\frac{1}{2}$ inches long, and as thick as a crow quill, ending in a brush of fine filaments. To this brush-like termination is due, not only the popular name of feathers by which these parasites are known to fishermen and others, but also the scientific name, Pennella, given by Oken a century ago to the genus to which they belong. As a matter of fact, only about one-half of the length of the parasite is visible outside the fish. If followed by dissection, it will be found to penetrate the flesh for a considerable distance, and to end often, if not always, near one of the great blood vessels in a globular head provided with large branched processes. Like the roots of the plants, these processes have the function, not only of fixing the parasite in place, but possibly also of helping to absorb nourishment from the blood of the host. Whether this be so or not, the parasite is not dependent (as are some other Crustacean parasites) on this vegetable-like method of getting its food, for it has a mouth and a spacious gut, and on the head are some microscopic vestiges of the limbs that were present in the larva.

Dr. Calman furnishes a certain amount of information concerning the life-history and reproduction of this curious parasite. While the life-history has not been fully followed out, it is thought probable, by analogy, that this form begins life as a free-swimming larva, which only late in life settles down to a parasitic existence. Exactly where or how it thus settles down we do not know, nor whether the flying fish is the first host it seeks. Dr. Calman considers it very likely that there is a temporary stage on another host, just as the Lernaea of the haddock and whiting passes through a stage in which it lives on the gills of the plaice, and the more nearly related Pennella of the dolphin (Coryphaena) is parasitic as a larva on the gills of cuttle fish.

As regards reproduction, no certain knowledge is as yet available. In most species other than the present one, impregnation takes place in the free-swimming stage, and the males do not develop any further, and only the females become fixed to a final host to complete their development and produce their eggs. In certain forms of the present genus, however, microscopic individuals have been found attached to the parasitic females *in situ*. Dr. Calman points out that this may occur in the present species.



FIG. 7. FLYING FISH WITH COPEPOD PARASITE *in situ*.

In conclusion it will be acknowledged that, in spite of the useful information recorded in the foregoing note, much yet remains to be found out concerning this parasite, in common with many other marine objects of economic importance in West Indian waters.

The specimens described in the above note are identified as *Pennella exocoeti*, and the flying fish as *Exocoetus speculiger*.

MARKET REPORTS.

London.—The West India Committee Circular, December 28, 1915.

Arrowroot—$2\frac{7}{16}d.$ to $3\frac{1}{16}4d.$
Balata—Sheet 2*s.* 6*d.*; block 2*s.* 1*d.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations.; Grenada, no quotations; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—No quotations.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{3}{4}d.$ to 17*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 60/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—7*d.* to 2*s.* 4*d.*
Nutmegs—$4\frac{3}{4}d.$ to $7\frac{1}{2}d.$
Pimento—$2\frac{1}{4}d.$ to $2\frac{3}{4}d.$
Rubber—Para, fine hard, 3/; fine soft, 2/9; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., January 22, 1916.

Cacao—Caracas, 17c. to $17\frac{1}{4}$c.; Grenada, 17c. to $17\frac{1}{4}$c.; Trinidad, 17c. to $17\frac{1}{4}$c.; Jamaica, $15\frac{3}{4}$c. to $16\frac{1}{4}$c.
Coco-nuts—Jamaica and Trinidad selects, $32·00 to $33·00; culls, $21·00 to $22·00.
Coffee—Jamaica, $8\frac{3}{4}$c. to 12c. per ℔.
Ginger—14c. to 16c. per ℔.
Goat Skins—Jamaica, 49c.; Antigua and Barbados, 47c. to 49c.; St. Thomas and St. Kitts, 46c. to 48c. per ℔.
Grape Fruit—Jamaica, $1·25 to $1·75.
Limes—$4·50 to $5·00.
Mace—35c. to 43c. per ℔.
Nutmegs—15c. to $15\frac{1}{4}$c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—4c$\frac{1}{2}$. per ℔.
Sugar—Centrifugals, 96°, 4·64c. to 4·77c.; Muscovados, 89°, 3·99c. to 4·12c.; Molasses, 89°, 3·87c. to 4·00c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., January 20, 1916.

Cacao—Venezuelan, $17·50 to $18·00; Trinidad, $17·25 to $18·25.
Coco-nut Oil—90c. per Imperial gallon.
Coffee—Venezuelan, 10c. to 14c. per ℔.
Copra—$5·75 to per 100 lb.
Dhal—$6·75
Onions—$5·00 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 ℔.
Rice—Yellow, $6·10 to $6·25; White, $6·50 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., January 25, 1916; T. S. Garraway & Co., January 26, 1916.

Arrowroot—$5·00 per 100 ℔.
Cacao—$15·00 per 100 ℔.
Coco-nuts—$16·50 husked nuts.
Hay—$1·90 per 100 ℔.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $100·00 per ton.
Molasses—No quotations.
Onions—$12·00 per 190 ℔.
Peas, Split—$9·50 to $12·50 per 210 ℔.; Canada, $3·00 per 120 ℔.
Potatoes—Nova Scotia, $3·00 to $3·75 per 160 ℔.
Rice—Ballam, $6·30 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·65 to $3·80.

British Guiana.—Messrs. Wieting & Richter, January 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per ℔.	20c. per ℔.
Cassava—	$1·20	——
Cassava Starch—	$10 to $11	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	8c. to 8$\frac{1}{2}$c.	9c. per ℔.
Dhal—	$7·00 to $7·25	$7·25
Green Dhal	——	——
Eddoes—	$1·92 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·25	$3·25 to $3·50
Lisbon	——	——
Potatoes--Sweet, B'bados	$1·92	——
Rice—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
Tannias—	$3·12	——
Yams—White	$2·40	——
Buck	$3·12	——
Sugar—Dark crystals	$3·60 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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The Principles of Crop Production.

THE lecture delivered last November before the Chemical Society of London by Dr. E. J. Russell, Director of the Rothamsted Experimental Station, comprises a very clear and interesting statement of current ideas in relation to the chemistry of the soil. Dr. Russell proceeded to show that, since the year 1840, when Liebig, by a brilliant stroke brushed aside the popular conception that the plant took up its organic matter from the soil, we have been steadily bringing fresh light to bear upon the mysteries of plant nutrition, and that at the present time it is possible to enunciate certain fundamental principles. The first one, which is now recognized by everyone, is that the plant must have a sufficient supply of all necessary nutrients, especially of nitrogen, potassium and phosphorus. The second is less fully appreciated, and has reference to soil bacteria. As has often happened in the history of agricultural chemistry, the originating idea of this principle was obtained from an outside technical problem, in the present case from the investigation of Schloesing and Müntz into the better purification of sewage. They found that satisfactory purification involved the conversion of ammonia into nitrate, which later they found out was effected through the agency of bacteria, and that in experiments these could be supplied in a little extract of soil. It was at once seen that the soil was not an inert mass, but that it was teeming with life and pulsating with change. The decomposition of organic matter was more fully investigated, and the conditions under which the end-products like gaseous nitrogen, nitrates and carbon dioxide are formed, were established. This led to the enunciation of the second principle, that the biological decompositions in the soil must proceed smoothly and quickly with a minimum loss of nitrogen.

Thirdly, there is the principle of the limiting factor. Plant growth increases with increasing supply of any one of its favourable factors, but this only happens so long as the supply of every other factor is adequate. When anything is lacking, the increase in growth is not kept up, and additional supplies give no extra crop. Finally, a stage is reached when the extra supplies may harm, either by direct injury, or by cutting

out another indispensable substance. This is very well illustrated by the injurious effect of too heavy a dose of a particular artificial manure. In short, all the requirements of the plant must be satisfied. Anyone left unsatisfied constitutes a limiting factor, preventing further growth. Increases in any one factor give increases in growth until something else proves insufficient and becomes a limiting factor.

It is quite possible that future investigators may establish other principles besides these. Indeed it has already been suggested that there are certain directive agents in the soil in the nature of hormones found in animals, which may regulate plant nutrition To these the name of auximones has been given. Little can be said definitely about them at present until the subject has been more fully investigated.

A very important aspect of plant nutrition is its physical side. The study of the higher physics of the soil is only in its infancy, but some important principles have become established already. For example, there is the question of adsorption relationships. The discovery—and it may be noted that this again is an outside one—that charcoal can take up and keep in spite of the most thorough washing small quantities of dilute acids by virtue of the so-called surface tension, led to a consideration of this phenomenon in relation to the soil. It has been found that a similar relationship exists between phosphates and soil particles. Clay soils adsorb more phosphates than sandy soils, which explains what has long been observed, namely that clay soils in spite of a high phosphate content are often unable to meet the requirement of plants in this respect. In other words, there is a competition between the plant and the soil for phosphate.

Another principle of soil physics, again the result of an extraneous observation, concerns what is known as 'soil climate'. Whitney at the time of his connexion with the United States Weather Bureau observed that both the quality and quantity of tobacco crops were connected closely with climatic conditions, and further with certain soils irrespective of manuring. This led him to bring the production of quality into line with 'soil climate', by which is meant soil temperature, moisture content, air supply, etc., and Whitney was able to show that these factors can be correlated with the size of the soil particles. In other words, the mechanical analysis of a tobacco soil is of far greater importance than the chemical. High grade tobacco can only be grown on soils having a low proportion of clay particles.

The foregoing principles are general in their application, that is to say, we have no reason to believe that that they do not hold good for tropical soils. It is only in regard to the extent to which the different factors are present that variation exists. The chief limiting factor in the tropics is dryness, whereas in temperate regions it is generally lack of warmth.

In concluding this review of Dr. Russell's lecture, it should be pointed out that the speaker limited himself to a consideration of the principles of production solely in relation to the soil. In the tropics we have attacked the subject of crop production through the plant. The tendency has been to improve production by means of varietal selection, to make the plant fit the soil rather than the soil fit the plant, and very considerable success has attended activities in this direction. Particularly has this been so with sugar-cane and with cotton in the West Indies. The study of tropical soils has been somewhat neglected chiefly on account of the more elaborate equipment required for such work, and also because plant selection leads quicker to results of practical value. Again we have come to realize as the result of experience that climatic conditions—and chiefly the climate of the air rather than Whitney's climate of the soil—are of paramount importance, determining as they do the distribution and productivity of crops. In this connexion humidity of the air is of first importance, and is one of the first principles of crop production in the tropics. At the same time the principles of soil chemistry hold good in their particular realm, and especially the biological changes referred to in the second of Dr. Russell's three principles. In considering crop production, however, we must always remember that there are two main aspects: the root and its environment, the soil: the foliage and its environment, the air; and further, that there is a close relationship between the air and the soil just as there is between the foliage of a plant and its roots.

In regard to the recent examinations in practical agriculture conducted by the Imperial Department, information has been received to the effect that the certificate gained by Mr. Stanley E. Hadley, of Grenada, was presented to him by the Governor at a meeting of the Legislative Council held on February 4. We may also state that at a meeting of the Antigua Agricultural and Commercial Society held on February 4, a similar certificate was presented to Mr. Arnold Gallwy, by His Excellency the Acting Governor of the Leeward Islands. Dr. Watts, C.M.G., the Imperial Commissioner of Agriculture was present on this latter occasion.

SUGAR INDUSTRY.

ANTIGUA SUGAR FACTORY.

The following information is taken from the Directors' Report, 1915:—

The cane crop of 1915 suffered severely both in quantity and quality from unfavourable weather. The shortage in quantity was fairly well made up by canes from neighbouring outside estates. The results from the inferior quality would have been very marked had it not been that, owing to improvements in the plant and in the manufacturing methods, the Factory work was much better than in any previous year. The price of sugar has ruled at a high level, so the results of the year are very satisfactory.

The number of hours in which the mills have to be stopped owing to want of cane is an increasing cause of loss and trouble. This arises apparently from many of the estates paying their labourers on Saturday night, so they have no time to buy their household supplies till Monday, and they accordingly take a holiday then. If all labourers were allowed to break off work at 11 a.m on Saturdays and were paid then, or on Friday afternoons, it would help the Factory work, and the estates would benefit by their half of any saving which resulted therefrom.

The canes supplied have been (in tons) as follows:—

	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Original Contractors.	20,576	24,065	22,506	24,228	23,374	26,355	21,308
New Contractors and outside Estates	14,646	20,712	29,398	32,478	44,880	53,751	57,993
Peasants.	2,062	3,542	3,212	2,664	2,094	2,924	2,219
Total.	37,284	48,319	55,116	59,370	70,348	83,030	81,520

The sugar made and the prices realized are as follows:—

	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Sugar (in tons)	3,995	5,390	5,472	6,239	7,336	9,131	8,390
Yield per cent. of canes	10·72	11·16	9·93	10·51	10·43	11·00	10·29
Price of sugar per ton	£ s. d. 10 7 5	£ s. d. 12 6 8	£ s. d. 10 11 5	£ s. d. 13 5 3	£ s. d. 9 8 7	£ s. d. 9 1 6	£ s. d. 16 7 9

After charging Revenue with £6,500 for Debenture and 'Additions' Sinking Funds, there remains a surplus of £34,908 5*s.* 9*d.*, to be allocated as follows, in terms of the Agreements: To New Contractors £12,763 3*s.* 8*d.* (equal to 4*s.* 4·82*d.* per ton of canes), to Original Contractors £11,072 11*s.* 1*d.* (equal to 10*s.* 4·71*d.* per ton), and to 'A' Shareholders £11,072 11*s.* 0*d.* As the New Contractors received a first payment of 17*s.* per ton for canes, the bonus addition brings the total payment up to 21*s.* 4·8*d.*: in the case of the Original Contractors the first payment was 15*s.* 3·6*d.*, which on addition of the bonus becomes 25*s.* 8·3*d.* per ton.

CHEMIST'S REPORT FOR 1915.

According to general custom, a short statement is given below concerning the working of the above Factory as given in the Chemist's Report (for 1915).

	1915.	1914.
Cane crushed, tons	81,520	83,030
Sugar made, tons	8,390	9,150
Tons of cane per ton of sugar	9·71	9·07
Recovery on 'indicated' sucrose in juice, per cent.	90·39	87·28
Recovery on 'indicated' sugar in cane, per cent.	82·60	79·09
Water in megass, per cent.	47·14	48·35
Normal juice lost in megass per 100 fibre	40·5	42·8
Average composition of first mill juice:		
Total solids per cent.	18·45	20·15
Sucrose	15·33	17·06
Purity	83·07	84·67
Total juice, including maceration water:		
Total solids, per cent.	14·94	15·93
Sucrose	12·41	13·49
Purity	83·07	84·67
Maceration per cent. on first mill juice	23·5	26·5

NEW FACTS CONCERNING SKIN DISEASES OF CATTLE.

In this Journal, Vol. XIV, p. 123, was published a summary of observations recorded on the Antigua skin disease of cattle published in full in the *West Indian Bulletin*, Vol. XV, pp. 41-3. It was suggested that this disease, which shows itself in eruptive and dry lesions of the skin and later in horny scabs, might be due to a fungus. Several suspicious genera of fungi were isolated from the skin, but it was not found practicable to conduct inoculation experiments with these. No organisms were detectable in the blood of the infected animals.

The theory of fungoid causation is supported by recent work on a skin disease of cattle in the Belgian Congo. In the *Bulletin Agricole du Congo Belge*, Vol. V, No. 4, December 1914, a malady know as 'Dermatose contagieuse' is described, which bears considerable resemblance to the Antigua disease in the West Indies. Inoculation experiments have shown it to be caused by a fungus named *Dermatophylus congolense*. The disease manifests itself on the animal's body either in a localized or general form. The localized affection is confined to the neighbourhood of the anus, and this occurs in the dry season. In the wet season the affection spreads, and humidity and high temperature are therefore regarded as the most important predisposing causes. Consequently treatment consists first in keeping infected animals in covered yards—cool and dry, and away from the healthy ones. If the affection is localized, tar may be applied. In the general form, carbolic pomade may be used with benefit.

As regards the question of resemblance between the West Indian and Congo maladies, it should be stated that nothing corresponding to the figure of the fungus in the Congo have been seen in investigating the West Indian form. The symptoms, however, show considerable similarity, especially the hair raised in tufts recorded in the case of both diseases, and the suppuration of the lesions. As the disease advances it spreads, in the Congo form, all over the animal, including its head. The animal dies in a state of emaciation ('marasme').



ST. KITTS-NEVIS: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

The weather in St. Kitts during the early and middle months of 1914 was generally unfavourable for plant growth, hence some difficulty was experienced in maintaining a good appearance of the Gardens at the Botanic Station.

The section of the report dealing with work in the nurseries shows that there has been very limited demand for economic plants such as cacao or limes. The total number of plants distributed during the year was 216, and consisted chiefly of palms and ornamental plants.

The economic plot experiments with provision crops, situated at La Guérite, consisted in varietal trials of sweet potatoes, yams, cassava, peanuts and tobacco, peas and beans; while manurial trials were made with pine-apples and Indian corn. While the above constitutes useful work, the most valuable lines of activity have been with cotton. The manurial experiments appear to show that the addition of fertilizers to cotton plots, under conditions obtaining at La Guérite at least. does not tend to remunerative results, the average returns from all the plots having been about the same as that from the no-manure plots. The results of the cotton selection experiments, which form an especially important part of the work with cotton, so far as the island is concerned, are very encouraging, as is evidenced by the increasing local demand for the selected seed; they point to the fact that the danger of importing cotton seed from other islands for planting purposes has been recognized by the cotton growers.

Work connected with insect pests and plant diseases was conducted chiefly by the scientific officers of the Imperial Department in regard to sugar-cane and cotton, the principal pests concerned being the grub of the brown hard back (*Lachnosterna patruelis*), the sugar-cane root borer (*Exophthalmus esuriens*), and the cotton worm (*Alabama argillacea*). A new pest in the shape of the common house cockroach (*Periplaneta australasiae*) was found attacking young cotton plants during the season under review.

Progress in the chief industries depends very largely upon the climatic conditions. Bearing in mind that 1914-15 was a period of low rainfall, it is not surprising that the cane crop was below the average, and hence also the exports of sugar, the latter being only 9,946 tons, of which 4,132 were grey crystals, and 3,814 tons muscovado. In regard to cotton, the past season was regarded as perhaps not quite so unfavourable. The war delayed sales and shipment, and prices were at one time low. But through the guarantee by the Fine Spinners and Doublers Association of a minimum price, stability has been given to the industry.

A new arrangement during the year was the establishment of a chemical laboratory and the appointment of a Chemical Assistant who conducts analytical work locally under the general supervision of the Government Chemist and Superintendent of Agriculture in Antigua. A report appears concerning science teaching at the Grammar School, which shows that a satisfactory standard continues to be maintained.

The publication under review includes a report by the Agricultural Instructor, Nevis. Experiments with cotton and provision crops continue to be carried on at the Experiment Station, as also work in connexion with cotton selection. Progress in the minor industries included important manurial experiments with coco-nut palms conducted at the coco-nut plantation at Pinneys estate, under the supervision of the Agricultural Department. Detailed results in connexion with these experiments have already been published in the *Agricultural News* (Vol. XIV, p. 398).

TRINIDAD AND TOBAGO: REPORT ON THE DEPARTMENT OF AGRICULTURE, 1914-15.

This report contains a large amount of interesting information from which the following facts have been abstracted for the benefit of our readers.

In regard to the agricultural exports from Trinidad during the year under review, the highest figures yet recorded are given for cacao. The value of the year's shipments amounted to £1,469,893. The prices obtained were satisfactory. The chief market for Trinidad cacao is the United States; France comes next, and the United Kingdom third; Canada comes sixth on the list and Germany fifth. With a favourable season for canes and very little injury from froghoppers, the exports of sugar increased from 32,655 tons to 48,087 tons. Towards the latter end of 1914, prices rose considerably owing to the war, and the part of the crop not sold before August benefited from the higher prices. In connexion with the exports of the Colony, special attention may be drawn to the large quantity of hides and skins that have been shipped. Their value amounted to £15,742. Turning to imports of leather it is stated that their total value, dressed and undressed and manufactured, was £14,990. These figures readily suggest the possibility of an opening of some promise for a new industry in leather making, and a boot factory. It is thought possible also, that Trinidad should produce all the starch it consumes instead of importing it from the neighbouring islands. In the matter of coco-nuts there was a falling off in the exports due to the previous dry season which affected the yield. The total value of the coco-nut products exported was £87,323.

Activity was continued in regard to agricultural education, which included work in connexion with the cacao prize competition, higher agricultural education, agricultural school shows, the home reading course, and agricultural pupil scheme.

Among the new industries that have been started are bamboo growing for paper making, and the production of cassava meal. For the former 1,000 acres of land have been selected for the purpose of growing bamboos.

In the botanical department much useful work has been carried on at the St. Clair nurseries. Budded cacao appears on the distribution list this year for the first time, and 366 plants sent out is a satisfactory beginning. The distribution of Robusta coffee again shows a large increase, and we may regard this as a revival of interest in coffee cultivation. The distribution of over 8,000 lime plants indicates that the high prices of lime products are having a beneficial influence on this industry. The total distribution from the nurseries of over 72,000 plants of all kinds, is nearly double that of last year.

Turning to Tobago it is noticed that the exports of cacao and coco-nuts for 1914, though below those for the last year or two, are satisfactory. Tobacco shows a great increase. Both tobacco and cotton are regarded as suitable crops for small growers in Tobago, though of recent years cotton cultivation has not proved a success.

The report of the Superintendent of Field Experiments refers to the manurial experiments with cane, and the testing of new varieties chiefly from Barbados. Dynamite experiments have been conducted on banana soil, and the figures obtained appear to show that not only a larger number of bunches has been reaped from the dynamited plot, but also that there has been a larger number of seven, eight and nine-hands branches, and consequently the average weight of the bunches from the dynamited plot is 20·4 lb. against 18·8 lb. from the undynamited plot. In regard to similar experiments with coco-nuts, both the dynamited and undynamited plots have made good growth. So far the undynamited plot is the better of the two. The bananas imported from Dominica were, during the year, classified according to varieties familiar in Trinidad. The variety known as Janshangu, allied to the Moko of Trinidad, is described as 'a good stout tree not too tall—good growth of suckers—should be a good shade for cacao, etc.' Another good variety is Marliban, allied to the Trinidad Silk: this is 'a good, strong tree, frui s in large bunches, fruit of good flavour.' Attention has been given to the cultivation of camphor, varieties of rice, and provisions. Several special investigations in connexion with crops were undertaken. These included tapping experiments with Hevea, investigation of possible thymol yield of Spanish thyme (*Coleus armaticus*), determination of camphor yields from young trees, production of alcohol from cassava and unripe bananas, etc.

In the report dealing especially with the Botanical Department, an interesting list is given of economic and other plants recently introduced. Those include vanilla varieties from Dominica and the Seychelles, Burbank's spineless cactus, kukui nut (*Aleurites moluccana*) from Hawaii, Malaybalay coffee from the Philippines, red flowering cotton from Northern Nigeria, and several other plants of interest. The Botanical Department has been concerned with the training of labourers at the St. Clair Station in nursery work, which is a very useful innovation, and with the carrying out of the Plant Protection Ordinance.

A detailed report is given of the Government Laboratory where a large amount of analytical work has been carried out, much of it outside of purely agricultural chemistry.

A great deal of attention continues to be devoted to live-stock in Trinidad. At the Government Farm, Valsayn, the stock, on the whole, kept in good health. The thirty-second annual sale of stock took place on February 19, 1915, when seventy head of cattle, eleven horses, ten pigs, and a variety of poultry were sold. The attendance was good and good prices were obtained. The farm maintains a fine herd of milking animals and also a good stud. There is a keen demand for pure and cross-bred young pigs in Trinidad. In Tobago there is also a stud farm which serves similar purposes connected with the general improvement of stock as the larger establishment in Trinidad.

During the year under review, Mr. W. G. Freeman the Assistant Director of Agriculture acted for eight months during the absence on leave of Professor Carmody, the Director. It has to be recorded also, that during the year Mr. J. C. Augustus, Curator of the Botanical Department, resigned his position to take up the more lucrative one of Manager of Sir Norman Lamont's properties. In spite of these changes the report under review shows that a great deal of useful practical work has been carried on by the Trinidad Department of Agriculture. The results of much of this are not included in the present report, which is chiefly administrative. For more detailed information the reader should refer to past numbers of the *Bulletin of the Department of Agriculture of Trinidad*, in which will be found also the results of valuable investigations conducted by the Board of Agriculture, in regard to pests and diseases.

FIELD SELECTION OF INDIAN CORN.

As a guide to the points to be observed in the field selection of Indian corn, the *Agricultural Gazette of New South Wales* (October 1915) furnishes the following information:—

(1) Avoid ears from plants which have a large amount of free space around them, unless such ears are considerably above the average, and select from those plants which produce a good ear under normal or adverse conditions.

(2) On rich ground maize suckers freely, and it is impossible to select all ears from suckerless stalks. The results obtained so far seem to indicate that a plant possessing a good ear in a normal stand, may be selected whether it has suckers or not; but it has been found that, if the suckers also bear ears in a normal stand, the plant is usually a good one to select from.

(3) No advantage has yet been obtained from selecting for two or more ears per stalk unless the first ear is up to the standard. It does not seem advisable to select for two or more small ears instead of one large one.

(4) Ears too high on the stalk in tall-growing varieties should be avoided, and in short-growing varieties the ear should not be allowed to get too close to the ground.

(5) Ears showing insufficient protection of the husk over their tip should be studiously avoided; especially is this an important factor on the North Coast where the weevil infests the crop in the field.

(6) Short-shanked ears should always be avoided, and the shank should neither be too thin nor excessively thick.

(7) Ears drooping at maturity are not only resistant to the weather, but have been found in most instances to yield much better than ears erect at maturity.

(8) The stalk should be thick at the base, and should not taper too rapidly up to the ear.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by Mr. W. R. Dunlop, Scientific Assistant, Mr. H. A. Ballou, M.Sc., Entomologist, and Mr. W. Nowell, D.I.C., Mycologist, will leave Barbados on March 9 by the C.R.M.S. 'Caraquet' for St. Kitts, for the purpose of conducting in that island a meeting of West Indian cotton growers. It is expected that the above officers will return by the C.R.M.S. 'Chignecto', due in Barbados on March 23.

COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 24, 1916, with reference to the sales of West Indian Sea Island cotton:—

About 100 bales of West Indian Sea Island cotton have been sold since our last report, chiefly St. Vincent, 16½*d.* to 18*d.*, and stained cotton at 11*d.*, with a few Nevis and Montserrat at 15½*d.*

Prices are inclined to advance in sympathy with the rise in Sakellarides Egyptian and American Sea Island, and quotations are raised 1*d.* per ℔.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February, 5, 1916, is as follows:—

ISLANDS. The sales of the week consisted of some small lots of odd bags and a Planters' crop lot, at prices ranging from 27c. to 32c. the buying being on account of the Northern Mills.

The total Island crop is estimated at about 6,000 bales, of which only about 500 bales remain unsold, consisting partly of crop lots, for which there is some demand. The limited unsold stock of Fine to Fully Fine is being held by owners off the market in anticipation of a better market later on. Consequently the crop lots, aggregating about 200 bales, are the only cotton seeking sale.

We quote, viz.:

Extra Fine	30c. = 19½*d.* to 20*d.*	c.i.f. & 5 per cent.
Fully Fine	29c. = 19*d.*	,, ,, ,, ,,
Fine	28c. = 18½*d.*	,, ,, ,, ,,
Fine off in class	27c = 18*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. The market was quieter this week, with sales of only 276 bales, but Factors remained very firm in their asking prices, refusing to sell except in round lots, grading from Choice to Fancy, which they are holding for 30c. There have been no sales as yet on these terms, so we renew our last quotations, although could buy with difficulty at them. Towards the close of the week there was more inquiry, which may result in sales at the above asking price.

We quote, viz.:

Fancy	30c. = 31c.,	landed.
Extra Choice	29c. = 30c.,	,,
Choice	28c. = 29c.,	,,
Extra Fine	27c. = 28c.,	,,

The Exports from Savannah for the week were, to Liverpool 100 bales, Northern Mills 649 bales, Southern Mills 50 bales, and from Jacksonville to Northern Mills, 212 bales.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the quantity and estimated value of Sea Island cotton exported from the West Indies for the quarter ended September 30, 1915:—

Colony.	Quantity, ℔.	Estimated Value £.
Barbados	68,959	3,448
St. Vincent	58,320	3,388
Antigua	7,750	420
Montserrat	237,820	14,676
St. Kitts	22,083	1,380
Nevis	9,708	607
Anguilla	—	—
Virgin Islands	3,754	219
Jamaica	7,063	353
	415,457	24,491

Besides the above Sea Island cotton, there were exported from Grenada 164,028 ℔., from St. Vincent 41,916 ℔., and from the Virgin Islands 1,281 ℔. Marie Galante cotton, of the estimated value of £4,901, £1,164, and £43, respectively.

There was also exported from Jamaica, 4,369 ℔. Cauto cotton, of the estimated value of £142.

COTTON EXPORTS FROM THE WEST INDIES, 1914-1915.

The following table gives the quantity and estimated value of Sea Island cotton exported from the West Indies for the year October 1, 1914 to September 30, 1915.

Colony.	Quantity, ℔.	Estimated Value £.
Barbados	290,347	16,737
St. Vincent	291,260	18,473
Montserrat	380,923	23,295
Antigua	80,750	4,196
St. Kitts	397,567	24,002
Nevis	305,154	18,777
Anguilla	33,750	2,048
Virgin Islands	31,361	1,600
Jamaica	12,844	600
	1,823,956	109,728

Besides the above Sea Island cotton, there were exported from Grenada 368,838 ℔., from St. Vincent 53,438 ℔., and from the Virgin Islands 3,852 ℔. Marie Galante cotton, of the estimated value of £9,310, £1,482, and £129, respectively.

THE DATE FOR PLANTING COTTON IN MONTSERRAT.

There can be no question that the manner of the distribution of the rainfall for the four months succeeding the date of planting is the chief determining factor in the production of a good cotton crop. To provide data showing the actual effect of the rainfall, two sections of the same plot were planted in the Montserrat Experiment Station, the first on April 10, and the other on May 4, 1914, all the land having the same treatment. The rainfall, in inches, was as follows:—

April 2·93, May 7·32, June 4·19, July 6·34, August 3·12.

The results were :—

	1st crop, (seed-cotton per acre).	2nd crop. (seed cotton per acre).	Total.
Plot 1 ⅛-acre planted. April 10	896	776	1,672
Plot 2 $\frac{1}{16}$-acre planted May 4	580	710	1,290

These results show the serious falling off in the 1st crop from plot 2 owing to the decline in the rainfall in August, and this applied generally to the May planted cotton in this year on the leeward side of the island.

The second crop also being influenced by the later distribution of the rainfall, was evidently more equally suitable for both plots, judging from the results, though some allowance must be made for some loss of cotton from injury by cotton stainers in the case of plot 2.

The results also show the very considerable importance in this season of the second crop of cotton, which though of a lower grade as regards quality, and of less value, may in some seasons mean the difference between profit and loss.

With regard to plot 1, the first crop had been picked at the end of October and the bulk of the second crop in December, while from plot 2, most of the second picking was obtained in January. Another point of interest is that the second crop of plot 1 suffered very little injury from cotton stainers, while their great increase in number towards the close of the year resulted in very considerable injury to the bolls of the second crop of plot 2.

It may not be considered out of place here to make a few remarks on the question of date of planting. Until about eight years ago the bulk of the crop Montserrat was planted in June and July, but there has been a gradual change to earlier planting, and most of the area is now planted in April. The planting of cotton before March 20 was prohibited by law in 1905, so as to enforce a close season for the control of pests and diseases. The record crop for the island was grown in a season where the distribution of the rainfall at Groves Station was—May 1·69, June 3·82, July 6·13, August 7·15, September 9·18, with other parts of the island in much the same ratio, and the bulk of the planting done about the month of May. On the light cotton soils this ratio of rainfall may be considered nearly ideal for the production of a maximum first crop, and the results from individual estates and our own experiments indicate that it is unimportant whether the planting takes place in April or as late as July. Unfortunately the rainfall is seldom distributed in this ratio, and a dry spell in the middle of the season has usually resulted in the ripening of the plants and the production of a second growth; but on late planted cotton a second crop is seldom realized, owing chiefly, it is now evident, to the serious damage done by cotton stainers. Taking all things into consideration, the conclusion has been arrived at that it is safer to adopt April planting, in the majority of localities, so that should the distribution of the rainfall prove unsatisfactory for the first crop of cotton, a good second crop may result before cotton stainers become unduly numerous. At the same time should the rainfall prove satisfactory up till five months from planting, and a maximum first crop obtained, there will not be so marked a development of second growth, and it may be negligible. (Annual Report on the Agricultural Department, Montserrat, 1914-15.)

THE BRITISH COTTON GROWING ASSOCIATION AND THE WEST INDIES.

The following remarks concerning the activities of the British Cotton Growing Association in the West Indies are taken from a paper entitled 'The Effects of the War on Cotton Growing in the British Empire', read by Mr. J. Arthur Hutton, Chairman of the Council of the Association, before a meeting of the Royal Society of Arts, held on January 26, 1916:—

In some ways our task in the West Indies was easier than elsewhere, for we had the invaluable assistance of expert agriculturists, who had been scientifically trained. I refer of course to the very able Director and Staff at the Imperial Department of Agriculture, who have done such splendid work for the West Indian islands. It would be a good thing for the Colonies, and indeed for the whole Empire, if such an organization existed in every one of our tropical possessions. As might be expected, with the help of this expert assistance, our efforts in the West Indies have been eminently successful, and these islands are now producing a sufficient quantity of Sea Island cotton to meet the present demand.

The Association have made several money grants to the West Indies for the payment of experts, the erection of ginning machinery, and providing improved seed. What, however, has probably been of even more assistance was arranging for members of the Association to visit the Islands, when they were able to get into close touch with the planters, and to impress on them the necessity of producing the quality of cotton required by the spinner. No less than three separate visits have been paid to the West Indies, and it is largely due to this that these Islands are now producing the finest Sea Island cotton grown in the world.

The principal assistance now rendered by the Association is in financing and marketing the crop, and I am glad to say that very little money has been lost in this direction. Undoubtly one of the principal reasons for the success of the British trade is our national honesty, and we have not had a single instance of our confidence having been taken advantage of in the West Indies.

An immense amount of time and trouble is devoted to the sale of the cotton, so as to ensure that the grower will receive the highest possible price. Sea Island cotton is not everybody's cotton, and it is by no means an easy matter to place it to the best advantage. The Association, however, recognize that they are in the position of trustees, and that it is their duty to do their best for any cotton confined to their care; though, in any case, it would be to their interest to obtain for the planter the highest possible price, for this is naturally the best method of encouraging him to continue and extend the industry. I am glad to say that the planters fully recognize the advantages offered them, and the bulk of the crop is consigned to us for sale.

His Honour Judge J. S. Udal [late Chief Justice, Leeward Islands] contributes to the September issue of *Folk-lore* an interesting account of the practices connected with what is known as the Obeah cult in the West Indies. These include the worship of the criboe, a large black, non-venomous serpent, and some ghastly rites of human sacrifice. It has been asserted by some writers that these practices have now ceased, but Mr. Udal has collected a large mass of evidence from law proceedings and other authoritative sources to prove that this is not the case. He ends by expressing the hope that 'now that the consciences of the public of our West Indian colonies and of the Home Government have begun to realize to what terrible lengths any indulgence towards or weakening in the repressive enactments against this widespread plague of Obeah may lead, that we shall see the rapid disappearance of any objectionable features in its cult, leaving only, it may be, a harmless residuum that may still afford some interest to the student and lover of folk-lore.' (*Nature*, November 4, 1915.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number is a review of a recent lecture on the Principles of Crop Production, with particular reference to the soil.

Under Sugar Industry, on page 67, is a statement showing the results obtained at the Antigua Sugar Factory during 1915.

On pages 70 and 71 are several articles concerning cotton.

A valuable pamphlet on Indoor Gardening for Schools is reviewed on page 75.

Insect Notes deal with pests in the Virgin Islands, while under Plant Diseases will be found two notes on sulphur and crops, and on a chart of tropical plant diseases, respectively.

West Indian Cotton Meeting in St. Kitts.

Arrangements have been concluded by this Department for holding a meeting, in St. Kitts, of the agricultural officers and certain of the leading planters interested in cotton production in the different islands working in conjunction with the Imperial Department of Agriculture. The meeting will begin on March 13 and end on the 18th prox. The provisional agenda embodies the various aspects of cotton production, including statements of the position in the different islands, the pests and diseases of cotton, cultivation and manuring, the commerce of cotton, utilization of by-products, etc. The following officers of the Imperial Department will be present: Dr Francis Watts, C.M.G., Commissioner; Mr. W. R. Dunlop, Scientific Assistant: Mr. H. A. Ballou, M.Sc., Entomologist: and Mr. W. Nowell, D.I.C., Mycologist. A full account of the proceedings will be published in due course.

The West Indies in Canada.

Two valuable publications, issued under the authority of Sir George E. Foster, K.C.M.G., Minister of Trade and Commerce of Canada, have been received at this Office from that Department. The first is 'The Canada Year Book, 1914'. This gives a full description of the constitution, agriculture, manufactures, communications, trade and commerce, law and education of the Dominion. It is a volume which will be found extremely useful for reference by any one interested in the country. On pages 423 to 437, respectively, are statistics showing the trend of trade between the Dominion and the West Indies. We reproduce the following:—

Value of Imports and Exports from and to the British West Indies, 1901-14.

	Imports from B.W.I. and British Guiana into Canada.	Exports from Canada to B.W.I. and British Guiana.
	$.	$.
1901	1,406,480	2,297,804
1902	1,702,293	2,456,132
1903	2,415,608	2,699,167
1904	7,006,892	2,662,524
1905	8,589,656	2,872,770
1906	7,521,360	2,847,381
1907*	5,208,892	2,188,542
1908	9,293,804	3,090,468
1909	9,088,596	3,054,073
1910	9,004,421	3,697,872
1911	10,262,643	4,736,005
1912	10,550,491	4,617,961
1913	9,443,393	4,591,105
1914	8,045,844	5,142,605

* Nine months only.

These figures are of special interest in connexion with the second publication, which shows the steady increase in the exports from Canada to the British West Indies. The decline in imports from these islands (1913 to 1914), was due largely to unfavourable climatic conditions resulting in crops below the average.

Reciprocity.

The second publication is of very direct interest to West Indians. It is entitled 'Canada and the West Indies', and consists of a report on the possibilities of trade under the preferential tariff agreement, by Mr. Watson Griffin, Special Trade Commissioner, who visited these islands in 1914. In his letter of transmittal Mr. Griffin acknowledges the useful information and assistance rendered by the Island Governments, merchants and planters, and by Dr. Watts, C.M.G., Imperial Commissioner of Agriculture. The critical question, 'Is the trade of the British West Indies worth going after?' is dealt with in Chapter 1, and Mr. Griffin answers in the affirmative, laying great stress upon the fact that the West Indies are each year developing their resources more and more. He also points out that there is the north of South American trade in Trinidad and British Guiana. As regards the effect of the preferential tariff, little can be said at present owing to the short time it has been in force. It is, however, of some significance that the people of the Colonies that joined in the trade agreement spend more per head on imported articles than Jamaica and the Bahamas, who stood apart from it.

The greater portion of the report, which runs to 173 pages, gives a description of the resources of and conditions in the West Indies. This information is very sound and to the point, and clearly indicates that Mr. Griffin did not derive his facts from books, but from the close questioning of the best local authorities, both official and otherwise.

Possible Improvement of Freight Facilities.

The shortage of merchant shipping due to the requirements of the Admiralty, which has commandeered a large portion of the available tonnage, with the consequent increase on the already exorbitant freights, has been attracting considerable attention in shipping circles both at Home and elsewhere. The subject is reverted to editorially in the *West India Committee Circular* for January 27 last, in course of which reference is made to a letter published in the London *Times*. In this Sir Alfred Booth, the Chairman of the Cunard Line, has pointed out that the tonnage entrances into ports of the United Kingdom in 1915 were 8,395,528 tons, of which 5,728,259 were British, against 12,634,518 tons, including 8,347,584 British in 1913, under peace conditions. Therefore, under war conditions the British tonnage entrances have fallen 31 per cent., the foreign 37, and the total tonnage entrances 33 per cent. In other words, these figures mean that during the last three months the carrying power of sixty-seven ships had to do the work of each 100 ships employed in times of peace, and of these sixty-seven ships remaining available, forty-six were British and twenty-one foreign. Thus, Sir Alfred goes on to point out: 'We can therefore only regulate the employment and freight of 46 out of every 67 of the ships that are now bringing in our imports—that is, we can control the movements and freights of less than one-half of the shipping we employed in times of peace.'

In the House of Commons on January 19, Mr. Runciman, in reply to several questions that were put to him on the same subject, stated, *inter alia*, that the Government were now taking steps to co-ordinate more closely the demands for tonnage for military and naval purposes, and for munitions and food for ourselves and the Allies; to secure further economy in the use of requesitioned tonnage; and to increase the amount of tonnage available. It may be noted also, that the *Times* is conducting a campaign in favour of the exercise of greater control over all British ships, and there is good reason to believe, the *Circular* concludes, that early steps will be taken to restrict the importation of luxuries such as motor cars, etc., which would materially relieve the situation, setting free as it will a certain amount of tonnage for indispensable foodstuffs, which have recently risen considerably in price.

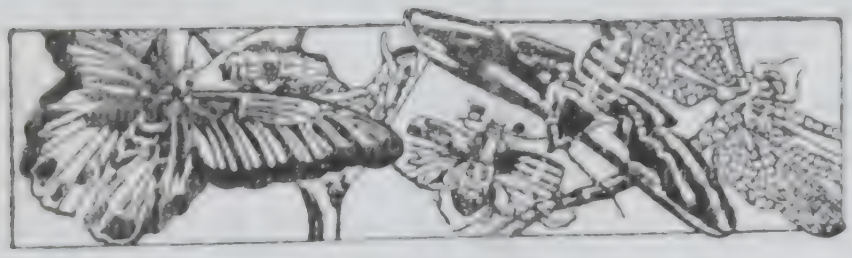
British Honduras in 1914.

In *Colonial Reports*—Annual No. 868, there is presented a report on the Blue Book of British Honduras for the year 1914. From this it is seen that the trade of the Colony declined in value to the extent of $412,412. This decline is attributed entirely to the war. At the beginning of the year everything pointed to an exceptionally good trade year; and for the first seven months of the year imports increased by over 8 per cent. against the figures for 1913; but from August onward they declined steadily, and at the end of the year were 21 per cent. below the figures for the corresponding period in 1913. The total value declined to the extent of $204,962. Similarly, from January to July, exports increased 54 per cent. over the figures for the same period in 1913, but from August onward they decreased steadily, and show a decline of 40 per cent. on the figures for the same period in 1913.

Among the chief articles exported, shipments of bananas, coco-nuts, and chicle (Sapodilla gum) call for special mention, the increase over those for 1913 being considerable. On the other hand, there was a great decrease in other commodities. Of the total coco-nuts exported, it is explained that nearly 3,000,000 were foreign imports re-exported. Two-thirds of the total chicle exported was not the product of the Colony.

No fewer than thirty Ordinances were passed by the Legislature during the year, amongst them being Ordinance No. 24, which enables the Governor to provide holdings for agriculturists who agree to grow food or other crops thereon during the war, and further enables the Governor to hire land for that purpose.

Included in this report is a table giving a comparative return of the rainfall in Belize for the ten years 1905-14. This shows that the average rainfall for the period was 95·80 inches; the maximum (130·93 inches) occurring in 1911, when rain fell on 166 days; and the minimum (63·76 inches) in 1910, rain falling on 124 days. But 1907 had the smallest number of days (80) on which rain fell, and 1913 the largest (167).



INSECT NOTES.

INSECTS IN THE VIRGIN ISLANDS.

An interesting collection of insects has been received from Mr. Fishlock, Curator of the Experiment Station, Virgin Islands. The following notes deal with some of the more important of these.

A New Borer.

This insect, *Batocera rubra*, L., was the subject of the Insect Notes in the *Agricultural News* for September 16, 1911 (Vol. X, p. 298), where under the title 'An Insect New to the West Indies', an account was given of its occurrence in St. Croix and Trinidad.

ORIGINAL HOME. *Batocera rubra* belongs to a genus of insects found in the Far East, which is not represented in the New World. The genus Batocera is found in India, Ceylon, throughout Polynesia to Australia, Africa and Mauritius. The species under consideration, which enjoys the widest geographical distribution, of any species of the genus, is recorded from India, Ceylon, Borneo, Sumatra, the peninsula of Malacca, the island of Bourbon, Mauritius and Africa.

OCCURRENCE IN NEW WORLD. Its occurrence in the New World would appear to be the result of very recent introduction. The first authentic record of its presence in this part of the world is that given in the *Agricultural News* article referred to above—viz., St. Croix, in 1911, where it is stated to have been known for about three years previously. The record of two specimens having been collected in the West Indies in 1906 by an officer of the United States Bureau of Entomology was not verified, because the species being entirely of eastern occurrence, the record was regarded with doubt.

At the present time *B. rubra* is known to occur in St. Croix, St. Thomas, and Tortola in the Virgin Islands, in addition to the one record of its capture in Trinidad.

FOOD PLANTS. In the Virgin Islands this insect is stated to attack a considerable number of plants: mango, avocado, papaw, banana, *Ficus elastica*, *Ficus* sp., hog plum, and a tree known as Bois flot (*Ochroma Lagopus*). In Ceylon this insect is stated to have been a serious pest of young coco-nut trees. In India it has been a pest of mango and Duki fig.

Mr. Fishlock states in regard to the specimens referred to: 'Of the grubs now sent, one was taken from beneath the bark of a tree of *Ficus elastica* growing in the Station, and the others from the trunk of a hog plum tree (*Spondias lutea*) which had been felled some time. In each case many beetles were observed close by: some were eating the leaves of the Ficus, and, in the case of the hog plum, crawling about the trunk, and on the ground near by. I am informed by Dr. Longfield Smith this same beetle has been responsible for the death of a number of wild fig trees (*Ficus* sp.) in St. Croix.'

Batocera rubra is one of the long-horned beetles. These beetles are borers in the trunks and branches of trees and woody plants, the adult female depositing eggs either under or upon the bark, and the larva or grub eating its way into the interior of the plant or tunnelling under the bark. Many species attack live wood, and live in tissues which are alive or just dying, while others live in dead and decaying wood. The species under consideration seems to be capable of attacking healthy trees, and also the grubs appear to be able to live and feed in decaying wood.

A DANGEROUS SPECIES. This insect is probably of very recent introduction to this part of the world, especially to the Virgin Islands. Such a large insect could not long escape observation; either its grubs and their attacks on trees would be noted, or the great, handsome beetles would attract attention. Introduced insects are always liable to become serious pests, and in the case of this one, it probably is not too much to say, unless some definite action is taken to check it, that *Batocera rubra* will develop into a pest of considerable importance in the islands where it occurs.

In other islands where this insect has not yet been found, precaution should be taken to guard against its introduction either in living trees or in dead wood.

METHODS OF CONTROL. Wherever a tree is found to be attacked, a careful search should be made for grubs, and these destroyed by probing with a wire, or by digging them out. Traps may be made by the use of logs of trees known to be food plants of this insect, left on the ground to attract the egg-laying beetles. When the logs are infested with grubs, they should be destroyed.

The adult beetles may be collected by hand.

THE INSECT. The beetles are very showy insects, the general colour being a dark brown, with reddish or yellowish spots on the wing covers. The scutellum is white, and there are wide lateral stripes beneath of shining white. The length is from 2 to $2\frac{1}{2}$ inches, the antennae, in the case of the males especially, extending beyond the tip of the abdomen.

The larvae attain to a length of 4 to $4\frac{1}{2}$ inches, and a thickness of nearly $\frac{3}{4}$-inch in the widest part, the thorax, just behind the head.

Rhinoceros Beetle (*Strategus titanus*).

Several large beetle grubs were included which are believed to be the larvae of *Strategus titanus*. This insect has been a serious pest of sugar-cane in St. Croix, where it has been controlled by the use of a poison bait made of finely ground megass (100 lb.) and Paris green (3 lb.).

Cotton Flower-Bud Maggot.

Cotton flower buds infested by a small maggot were submitted for examination. It was found that the insect concerned is the larva of one of the Cecidomyiidae, and it may prove to be the same as that which caused a considerable amount of loss to cotton growers in Antigua, and has been recorded from Montserrat. Specimens of the adult fly will be needed to settle this point.

In Antigua, the attack of the flower-bud maggot caused the bracts surrounding the buds to flare back, and the buds to drop. It is not stated whether the bracts flare in the Virgin Islands attacks, but it is to be inferred that they do, since the maggots act in the same way in both cases, being found amongst the anthers in the bud, where they live and feed.

Root Borer Weevil (*Diaprepes scengleri*) and the Cotton Lachnopus (*Lachnopus curripes*).

These two beetles were collected on lime trees. They are stated to attack the growing parts of limes and other

citrus plants, Bay plants, and cotton. The former is related to the Barbados root borer of sugar-cane (*Diaprepes abbreviatus*), and its grubs are probably root borers or root feeders on plants of various kinds. The Leeward Islands root borer (*Exophthalmus esuriens*) is another related form with similar habits in the larval stage. The adult possesses the well-known habit of eating the leaves of lime trees, and this habit seems to be shared by the Virgin Islands Diaprepes.

The cotton Lachnopus has been at times a pest of young cotton seedlings in Anguilla, Antigua, and Tortola. The species which occurs in Anguilla is *L. valgus*, that in Tortola is *L. curvipes*, while the Antigua species has not been identified. Specimens of insects of this genus have also been received from Nevis and Montserrat.

The genus Lachnopus is a large one comprising some forty-three species in the West Indies, according to the list given in a recently published catalogue. Little appears to be known of the life-history of these insects.

The only food plant recorded at the Office of this Department for the species mentioned has been cotton; and now to this is added, lime and bay. The early stages are not known.

Caterpillar Attacking Onions.

Several caterpillars of some noctuid moth were forwarded at the same time, with the note that they were attacking onions. These were very likely the larvae of *Prodenia commelinae*, which occurs throughout the West Indies and is known to be a pest of onions in certain places, and at certain times.

The remedy for cut worms is the use of the poison bait made of bran (25 lb.) and Paris green (1 lb) mixed to a stiff dough with water and molasses, and applied on the ground before the onion plants are set out. This poison bait is best applied in the late afternoon, as the cut worms feed at night and the bait will then not be dried out by the heat of the sun.

H.A.B.

The Artificial Production of Rain.—The artificial production of rain is to be put to the test of practice in Australia. According to *The Electrician*, the New South Wales Government will finance the experiments, which will be carried out by Mr. J. G. Balsillie, who for four years has been conducting research in this connexion, and who has patented his device. It is based on the following lines. In the laboratory he finds that if a room be filled with steam, the discharge of high tension direct current electricity together with the simultaneous discharge from a powerful Rontgen ray tube causes the whole of the air to be cleared of steam in one and a half seconds, the floor of the room being covered with large drops.

A captive balloon coated with metalic paint at a height of 6,000 to 7,000 feet will be used to discharge electricity into the atmosphere, and this, it is hoped, will cause the sufficient ionisation to provide nuclei upon which the moisture of the clouds may condense. Mr. Balsillie believes that a number of these stations would draw all the moisture from the clouds, and would also cause the cessation of natural thunderstorms. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, November 1915.)

INDOOR GARDENING FOR SCHOOLS.

There has just been published by the Imperial Department of Agriculture, a new pamphlet entitled 'Exercises in Indoor Gardening for the Use of Schools', by Dr. Francis Watts, C.M.G., Commissioner of Agriculture. Its pages contain a series of outline notes of practical exercises somewhat on the lines of work in a school garden, but such as are capable of being carried out indoors, and with assembled classes. The exercises thus outlined may be regarded as preparatory to the more extended work of a school garden itself, and should be found especially useful in elementary schools where difficulties are experienced in making outdoor gardening a successful feature of the curriculum.

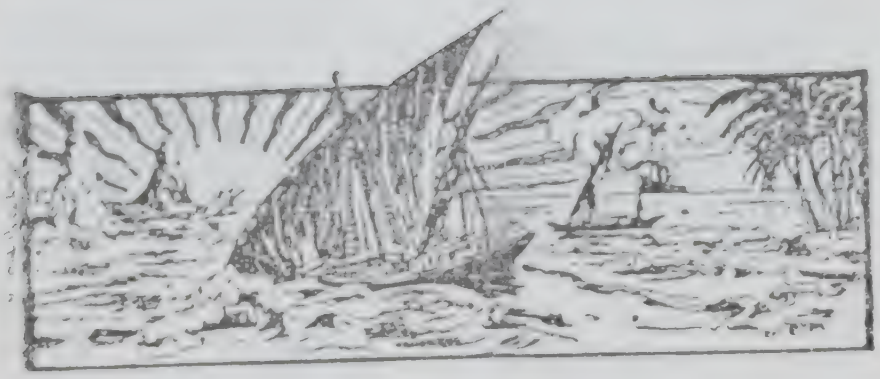
The notes are written with the intention that they should be used in conjunction with the text-book 'Nature Teaching' by the same author, which contains more detailed information than can be included or would be desirable in such a pamphlet as the present one. Teachers will realize that this pamphlet is intended to be suggestive rather than didactic. It is the general scheme outlined, which is more important than the individual instructions as regards material, etc., which under different conditions the teacher may find it convenient to modify.

There are in all eleven lessons. Each lesson is divided into a number of parts, about six on the average, and each part is worked through not in order of numerical sequence, but according to convenience as regards the growth of the plant material dealt with. An example of the scheme of study will give a better idea of the aim of the book. In the first chapter instructions are given concerning the sowing of bean seeds in pots and boxes. The subsequent parts in this lesson deal with an examination of the developing plants. But while this is taking place opportunity is taken of planting a quicker growing plant like mustard, so that there will be material in different stages of growth for study, thus avoiding any breaks in the continuity of the instruction. The work with the mustard seed is described in Lesson II. Hence Lesson II is started before Lesson I is finished. This method of procedure is an essential feature of these exercises. It will be realized that the bean plants having had an earlier start will flower about the same time as the mustard which was planted later, but which is quicker growing; thus two entirely different types of flowers will be available for comparison at about the same time.

Other lessons concern a similar study of the Indian corn plant from seed to flowering, the development of onion, beet and radish seeds, and the growing of plants from cuttings, and the budding and grafting of plants. It will be realized that much will depend upon the skill of the teacher in interposing appropriate exercises and so maintaining the continuity of the teaching. This will involve the exercise of some skill and judgment; the selection and preparation should not be left until the class is assembled for work, but must be made beforehand.

The pamphlet, which runs to nearly fifty pages, is well illustrated with a number of plates containing line drawings of the plants described, to large scale, which it should be the duty of the student to imitate from nature. Throughout the pamphlet the importance of making good clear outline drawings to scale is strongly emphasized.

This pamphlet is No. 82 of the Imperial Department of Agriculture Series, and can be obtained from any of the Department's agents, price 6*d*., post free 7*d*.



GLEANINGS.

A note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for May 1915, states that the method of examining bone-marrow for the bacteriological confirmation of anthrax diagnosis is a sure means of determining the presence of micro-organisms which give rise to this disease. This information will be noted with interest in places like Demerara and St. Vincent, where special attention to the question of anthrax has been given.

The effect of the war on chemicals and compounding ingredients used in rubber manufacture is dealt with in the *India Rubber World* for December 1, 1915. The effect has been to increase the price in some cases to an extraordinary extent. For instance, toluol has risen from 40c. per gallon to $4·25 per gallon. White beeswax has jumped from 10c. per lb. to 55c. per lb. Acetone, which by the way can be prepared by a simple process from molasses, has risen from ·12c. per lb. to ·30c. per lb.

As usual, the *West India Committee Circular* (December 28, 1915) devotes a large amount of its space to a consideration of agricultural affairs in the West Indies, and particularly to the information contained in the publications issued through the Imperial Department of Agriculture. An editorial in the issue referred to epitomises Dr. Watts' recent article on the Antigua Sugar Factory, and a special article is devoted to the Montserrat Lime Industry. A full page illustration shows a fine stool of sugar-canes in Antigua on Mr. Thomas Peter's estate.

The Administrator of St. Kitts has supplied this Office with a copy of a short Ordinance (No. 11 of 1915), which has recently been passed, amending the Sale of Food and Drugs Ordinance, 1887. The chief point about this Ordinance is contained in Section 3, which gives the Governor-in-Council power to make orders fixing the standard of purity for any articles of food or of any drugs. An Order in Council will soon be made, fixing the standard of purity of milk in St. Kitts and Nevis under the above Ordinance.

An enlightening bulletin of the United States Department of Agriculture is No. 267, issued from the Office of Markets and Rural Organizations, on the subject of wholesale distribution of fruits and vegetables on large markets. It is stated that one of the most practical steps the shipper can take to better his condition is to familiarise himself with business practices, and to secure a better knowledge of the way his produce is handled on the market. At the end of the bulletin is given a glossary of terms and expressions, which will be found useful for reference by those who are unfamiliar with the methods of marketing produce abroad

A disc plough with a second shaft bearing blades which break up the slice, is figured in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for April 1915. The main features are a number of sharp discs, mounted near each other on the same shaft, which cut into the soil by the weight of the whole machine, and lift by friction a slice of earth which is then broken up by a series of knives mounted on a second shaft, which may be situated over or behind a disc. In order to prevent the rapidly revolving knives being injured by stones, or the like, they are not rigidly attached to the shaft but are mounted in such a way as to allow relative motion between them. The above plough is a recent German invention.

The subject of *Bulletin No. 30* of the Hawaii Agricultural Experiment Station is the biochemical decomposition of nitrogenous substances in soils. It seeks to show the rate at which different forms of protein, for example, casein from milk, dried blood, and cotton seed meal, undergo ammonification under varying soil conditions. The different materials are converted into ammonia at greatly different rates. Casein is the quickest, and cotton seed meal and linseed meal the slowest, the highest concentration of ammonia from the former being on the fourth day. The rapidity of the changes referred to are important, and should receive consideration in discussing the manurial value of crop by-products, such as are now being extensively employed as manures on estates to take the place of, or at least to supplement, pen manure.

The *Journal of Agricultural Science*, Vol. VII, Part 2, for September 1915, contains several papers of interest in the tropics. Mr. J. W. Leather, Imperial Agricultural Chemist for India, deals with the effect of climate on soil formation, and also with the question of soil gases in connexion with the recent Rothamsted work: while an interesting paper by Messrs. Cooper and Nuttall, of the Cooper Laboratory for Economic Research, discusses the theory of wetting, and the determination of the wetting power of dipping and spraying fluids containing a soap basis. In this latter connexion they have worked out a convenient and ready means of comparing wetting powers, consisting in a slight modification of that employed for the determination of the emulsifying action of soap solution. Two papers appear also on 'probable errors': one in connexion with pig feeding trials, and the other in connexion with sampling in soil surveys.

An interesting contrast between the absorption power of live and dead roots is referred to in the *Journal of the Chemical Society*, Vols. 107 and 108 (December 1915). When live beet roots were placed in solution of calcium chloride, it was found that 41·31 per cent. of the calcium and 43·74 of the chlorine were removed from the solutions. Dead roots of the same plant removed 44 per cent. of calcium and only 26·25 per cent. of chlorine. Similar results were obtained with carrots. In experiments with sweet maize, the dead roots took up somewhat more calcium than chlorine. The presence of dead cells has, therefore, in some cases a marked effect on the results of plant culture, and it is desirable to avoid toxic solutions, which may kill some of the cells while the experiment is going on. In certain experiments the outer layers of beet and carrots were cut away with a knife, so that the solutions had to penetrate a layer of dead cells before reaching the living tissue.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore (Superintendent of Agriculture) informs us that Saman trees which were hampering the nursery work in the Botanic Gardens by shade and root activity have been cut down, while preparations are in satisfactory progress for next year's supply of lime plants. Citrus plants imported from Dominica and St. Lucia for the orchard are doing well. In regard to staple crops, the report mentions that at the time of writing the cacao crop was still coming in satisfactorily; 26,973 bags were shipped to December 31 as against 12,249 at same date in 1914, and 41,000 bags at January 31, as against 27,229 at the same date last year. Lime juice shows an increase also in shipments to date. The Superintendent of Agriculture and the Agricultural Instructor were appointed on a Committee of the Agricultural and Commercial Society to consider the revision of the Rules for the Cacao Prize Holdings Scheme. At a meeting of the Society held on the 27th ultimo, the revised scheme of Prize Holdings was passed. Both officers attended a meeting of Morne Rouge sugar growers to discuss the future of the Government sugar works, and the need for extending the area under sugar-cane cultivation on the Settlement. A meeting of peasant proprietors was held at River Salle, at which the Agricultural Instructor delivered an address on the subjects of draining, mulching, and hedges. The weather was rather dry during the first half of December, but from the 14th to the 31st rain fell every day: throughout the month of January also, seasonable showers were recorded.

ST. LUCIA. Concerning this island, Mr R. W. Niles (for the Agricultural Superintendent) reports that the following plants were distributed from the Experiment Stations: lime plants 1,000, economic 66, decorative 38, making a total of 1,104. The cacao crop was making slow progress, while the lime crop was nearly finished, and reaping operations in regard to sugar had commenced. The total quantity of concentrated lime juice prepared to date at the Government Lime Factory was 65 casks. The rainfall recorded at the Botanic Station for the month of January was 6·80 inches.

DOMINICA. In spite of an unfavourable season in many respects, writes the Curator (Mr. Joseph Jones), the exports of lime products during the year showed a slight increase over 1914, and were practically equal to the exports of the record year 1913. The year's crop, reduced to barrels, was 390,458. The work of fencing the new coco-nut portion of the experiment station was retarded owing to persistent wet weather. Consequently, the planting of coco-nuts during the month had to be postponed. Work in the chemical laboratory included the testing of samples of juice sent in by planters, analysis of sample of lime to determine suitability for citrate making, and investigations with raw and concentrated juices. Plant distribution consisted of limes 2,185, cacao 250, budded citrus 98, shade trees 250, miscellaneous 55, making a total of 2,838. The rainfall for the month of January was 10·79 inches.

ANTIGUA. From this Presidency Mr. T. Jackson, the Curator, reports considerable activity in connexion with the planting of cane variety experiment plots at the various stations, the reaping of the corn plots at Fitches Creek, trenching coco-nut plots and planting corn experiments at Skerretts. A fair number of new cane seedlings will be raised this year. The plants distributed were—cane plants 178,566, Eucalyptus 1,486, miscellaneous plants 56, and 2¼ barrels and 8 packets vegetable seeds. Respecting staple crops, it is stated that high winds have done damage to the cotton crop. Attacks of cotton caterpillars were experienced in some localities. The corn growing in the island does not look very promising. This is said to be due to a great extent to attacks of brown hard back grubs. Cotton selection is being carried out at Yeptons. The opening of an onion drying house is mentioned as a coming event of interest. During the month (January) 4·99 inches of rain were recorded at the Botanic Station.

ST. KITTS. The carrying on of general routine work is reported by the Agricultural Superintendent (Mr. F. R. Shepherd). Plant distribution included 4 lb. of Para peas and 3 oz. of Teff grass seed. Referring to staple crops, Mr. Shepherd states that the high winds during the month have ripened up the canes to some extent, but the good showers have kept them green and growing. Grinding at the Basseterre factory was timed to commence on February 1, and many of the estates have begun to cut canes. The returns per acre promise to be as good or better than anticipated. The muscovado estates are grinding, as sugar locally commands a high price. The factory has sold 6,000 tons sugar at a price which enables them to offer 15*s.* 6*d.* per ton canes, as first payment. The young cane crop is growing well and supplies will now be put in. As far as can be seen, the general condition of the cane crop is healthy. The cotton crop is all reaped and ginned. The returns per acre will be much below the average, owing to the bad season. Visits paid to Nevis revealed the fact that conditions here are better than in former years in respect of insect and other pests attacking the canes, which on this occasion were found to be free from termites. At a recent meeting of the Agricultural and Commercial Society, Mr. F. R. Shepherd and Mr. George Slack were elected President and Vice-President, respectively, for the current year, while His Honour the Administrator was made Patron. The thorough-bred stallion 'Tim Healy', on which a bonus of £30 was paid, has been sold out of the island, and the bonus refunded. This leaves the island without the services of a valuable animal. The rainfall for the month and year to date was 3·53 inches.

TORTOLA. Work in the Experiment Stations in this island included the usual cultural operations preparatory to planting. It is noted that the germination of selected corn has been very poor. Plants distributed were—canes 300, cassava 200, limes 90, onions 97,900, potatoes 536, coconuts 6, making a total of 99,032. Mr. Fishlock, in regard to pests, states that the worst attack of cotton worms he has known was experienced during the latter part of November, December, and the first days of January. Repeated applications of Paris green had to be made.

Writing at a later date further plant distribution is recorded, including 13,200 onion slips, which make a total of 233,000 onion plants distributed for the season. The cotton plots have improved greatly during the last three months, due to good climatic conditions. The yields will, however, be poor, and the total crop small. Worms of various kinds have attacked practically all growing crops during the past two months. At a meeting held in Virgin Gorda, the planting of ground nuts and Rounceval peas on a commercial scale, as also the improvement of the local breed of goats were discussed. The rainfall recorded in January was 3·63 inches, the average for the previous fifteen years for this month being 2·96 inches.

PLANT DISEASES.

THE EFFECT OF SULPHUR ON CROPS.

In connexion with the use of sulphur as a fungicide or insecticide, the question sometimes arises as to the direct effect of its application to the soil. It has often been remarked that certain crops so treated have shown a marked improvement in appearance, apart from the benefits derived from the check to the pest or disease towards which the treatment is directed.

The subject is still far from being fully investigated, but papers have recently appeared which afford some information upon it.

It is clear that the effect is liable to wide variations, ranging from toxicity to highly beneficial action, according to the species of plant and the composition of the soil concerned.

It has been shown that elemental sulphur added to the soil gradually undergoes oxidation to sulphates, in which form it serves as a source of supply for the sulphur needed in certain organic compounds. There would appear to be danger from acidity unless lime is present in the soil, or is added along with the sulphur, and danger even in the presence of lime from the intermediate formation of sulphites.

In a series of plot experiments on Leguminous, Cruciferous, and Graminaceous plants it was indicated that growth in certain cases in the first two orders was measurably increased by the addition of sulphates, and in both barley and oats seed production was stimulated. Calcium sulphate was more effective than the more soluble sodium sulphate. Elemental sulphur was generally harmful. In field trials on alfalfa in Oregon, the use of either sulphur or sulphates has given increased yields, amounting in a number of instances to from 200 to 300 per cent., and in one case, with iron sulphate, to 1,000 per cent.

It has been contended that apart from its manurial effect, sulphur acts on the soil flora and stimulates the breaking down of organic matter, and it has been shown that very heavy applications (900 lb. per acre) while highly injurious on poor soils, had no ill effect on a loam rich in humus.

It would be interesting, especially in view of the existence of local sources, to study the effect of sulphur in tropical soils.

A Chart of Tropical Plant Diseases.—A copy has been received from the Board of Agriculture of British Guiana of a chart, measuring approximately $2 \times 2\frac{1}{3}$ feet, entitled, *The Fungoid Diseases of Garden and Field Crops in British Guiana*, prepared by C. K. Bancroft, M.A., F.L.S., Government Botanist. The middle of the sheet is occupied by parallel columns giving, opposite to crop headings, a list of diseases under their common names, short diagnoses for their identification, and condensed instructions for treatment. The bud-rot of coco-nuts, for example, is dealt with as follows:—

DESCRIPTION. 'Appearing usually in trees which are bearing, younger trees being frequently free of the disease.

'Young and immature nuts frequently fall.

'Flowers blacken and die, sometimes before the sheath opens.

'Leaves break and hang down, frequently yellowing previously.

'The bud finally rots and emits an offensive smell.'

TREATMENT. 'Drain well and practise good cultivation methods which will establish a good growth of the trees.

'In trees recently affected, a bag of common salt may be tied to the central shoot above its base.

'Dying and dead palms should be cut down at once and the crowns and trunks burnt or buried in the ground.'

The marginal columns of the chart contain instructions for the preparation and application of fungicides, and a note on *Plant Sanitation and the Nature of Diseases in Plants.*

W.N.

SOLUBILITY OF ROCK IN PURE WATER.

Professor J. B. Harrison, C.M.G., M.A., Director of the Department of Science and Agriculture, British Guiana, has furnished this Office with the following extract from a paper by him, published in the *Geological Magazine*, Vol. VII (1910), concerning the very interesting subject of the solubility of rock constituents in pure water. It will be realized that the action referred to results in only minute quantities of mineral matter being dissolved *at any one time.* Nevertheless, with continually repeated washings a very large quantity will become dissolved, resulting eventually in complete degradation of certain rocks. The nature of the action concerns the interchange of 'ions' between the water and the salts in the rocks. It is a phenomenon which does not appear to have received the recognition it deserves as being important in the weathering of rocks and consequent improvement of soil fertility:—

Some ten or eleven years ago, whilst lecturing on agricultural science, I used the following experiment to illustrate the action of pure water on rock. Rock powder was prepared from various types of rock by grinding on a bucking plate. About 20 grams of the rock powder was placed in a beaker, and from 100 to 150 c.c. of cold, recently boiled distilled water poured on it. To the water thus freed from carbonic acid a few drops of a solution of phenol-phthalin were added. In the course of a few minutes the water commenced to change to purple, and after ten minutes or so had elapsed, the depth of colour produced served as a measure of the rates of decomposition of the various rocks by the water. I found that the most readily decomposable rocks were felspar-porphyry and porphyrite, the next being granitite-gneiss, followed by granite and granitite. The basic rocks were more slowly attacked by the water. After standing for some time when the colour of the water had ceased to deepen, it was poured off filtered off completely, the rock powder again treated with fresh quantities of the boiled water and phenol-phthalin, when the gradual colourization again ensued. This, if desired, could be repeated many times, using the same rock powder. The experiments well illustrated the action of water free from carbonic acid on the rocks, and its repetition with successive quantities of water showed it to be a mass action. The rates of decomposition of the various rocks thus indicated were found to correspond with the extent of their denudation and degradation on the lower-lying lands of the colony.

AN ADDRESS TO ANTIGUA.

At a general meeting of the Antigua Agricultural and Commercial Society, held on February 4, 1916, at which were present His Excellency the acting Governor, the Honourable the acting Colonial Secretary and most of the island's representative planters, Dr. Francis Watts, C.M G., Imperial Commissioner of Agriculture for the West Indies, gave an address on subjects of current interest to local agriculturists.

Referring first to the subject of sugar, Dr. Watts stated that the industry was now in a good condition, and the prospects for the coming crop now being reaped were exceedingly good. After the war, Dr. Watts believed that the British Colonies as a whole would be in a better position in regard to the sugar industry than they had been. The factory problem was a solved one, though there had been many debates in the Antigua Society many years ago concerning the advantages of a factory like Gunthorpes, which has since proved itself a financial and economic success. The efficiency of central factories could be seen from the fact that it takes but little over 9 tons of cane in the Antigua Factory to produce 1 ton of sugar. Coming to the question of pests and diseases of the sugar-cane, Dr. Watts referred to the recently established result that the rind or red rot disease of sugar-cane can be caused by more than one fungus. The matter was referred to in order to allay any apprehension which might arise because a new fungus had been discovered. The disease, whatever its cause, requires the same measures of treatment and control, and the newly mentioned fungus has probably long existed in canes in these islands, though it has not been previously identified with the disease.

Coming to cotton, Dr. Watts referred to this as a very uncertain crop: even when it is reaped and packed in bales one is not sure of one's crop: only when it is sold is one certain. This necessitates the employment of very careful methods of production and sale. Dr. Watts referred to the decline of the American Sea Island cotton industry caused principally by inter-crossing and the spread of the cotton boll weevil. The Commissioner called attention to the importance of maintaining a good type—in fact a pure strain of cotton in each island by the home production of seed for planting in each particular island. He referred to the mistake which Egypt had made in not having taken the advice of experts in regard to the maintenance of pure strains in that country. This neglect, however, was advantageous to the West Indies, because under present conditions in Egypt it is doubtful that they will ever produce a fine enough type to enter into direct competition with the best Sea Island. In connexion with these matters Dr. Watts referred to a meeting of those interested in Sea Island cotton which was to take place in St. Kitts early in March. The Commissioner was sorry that a representative of the buyers would not be there, but he hoped at the next general West Indian Conference to have one.

The growing of corn was the next subject dealt with. Now that the Government had established a corn drier, the planters should do their share and put a larger area under this crop. As things were at present, 10*s.* to 14*s.* a bag had to be paid for imported corn; much of this might be grown locally and so prevent money from going out of the island. There had been some complaints about corn pests. Most of these could be dealt with by methods known to planters. As regards soil grubs corn might be planted as a trap crop to attract the grubs, when the corn and the grubs could be destroyed at the same time.

Dr. Watts did not think that Antigua as well as other islands were doing justice to the bean crop. The bean known in Antigua as Barbuda bean (*Phaseolus lunatus*) would sell well if it could be developed into a crop. These beans sold from 4c. to 4½c. per ℔. in Canada. Besides the above-mentioned one, there are many beans and peas suited for field cultivation as a human food or fodder crop, and in this connexion the horse bean was mentioned.

For some time past the speaker had been calling attention to the possibilities before the production of pork and bacon in the West Indies. While the war prevented capitalists from investing in such a new industry, small experiments were being made which, if they proved successful, might tend to lead to the establishment of small central bacon factories. The speaker asked that a committee be formed from the Society to consider his views on the production of pork and bacon.

ACID SECRETION OF THE GRAM PLANT.

The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for May 1915, contains the following interesting note:—

The gram (*Cicer arietinum*) secretes and deposits all over its surface an acid liquid which is used fairly extensively in medicine in Western India. It was known to contain malic, oxalic and a small quantity of acetic acid. The writer proposed studying this liquid more closely, and for this purpose material was collected by washing the plants with water. Some other material was also bought in the bazaar. The examination confirmed the presence of oxalic and malic acids, and of about 0·2 per cent. of volatile acids. The maximum amount of acid was found when the pods were fully developed and before they had begun to dry. From the tenth week onwards, the proportion between the malic and oxalic acids was very constant, and was as 94 :6 respectively. Pruning the plants increased the amount of acids to a maximum of 30 per cent. of the dry matter, probably owing to the increase in the number of pods caused by the pruning. Washing the plants, unless repeated too frequently, stimulated the production of acids, an interval of six days between the washing proving the most favourable. The acid appeared to be produced in the glandular hairs which are found on all parts of the plant, and especially on the pods.

The usual method of collecting the acid in India (where gram is the most widely grown pulse), consists in tying a piece of clean cloth to a stick and drawing it over the gram plants till sufficiently wet, when the liquid thus absorbed is wrung into an earthen vessel. The total amount of malic acid that can thus be collected is about 2,700 grams per acre The removal of this acid secretion has no injurious effect on the crop

MARKET REPORTS.

London.—The West India Committee Circular, January 27, 1916.

Arrowroot—2½*d.* to 4½*d.*
Balata—Sheet 2*s.* 6½*d.* to 2*s.* 7*d.*; block 2*s.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations.; Grenada, 81*s.* to 84*s.* Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£37.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 67/6 to 85/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6½*d.* to 2*s.* 6*d.*
Nutmegs—6½*d.* to 9½*d.*
Pimento—1¾*d.* to 2¾*d.*
Rubber—Para, fine hard, 3/5½; fine soft, 3/5; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 10, 1916.

Cacao—Caracas, 15¼c. to 15½c.; Grenada, 15¼c. to 15⅝c.; Trinidad, 15c. to 15½c.; Jamaica, 14c. to 14½c.
Coco-nuts—Jamaica and Trinidad selects, $33·00 to $34·00; culls, $22·00 to $23·00.
Coffee—Jamaica, 9¼c. to 12c. per ℔.
Ginger—14c. to 16c. per ℔.
Goat Skins—Jamaica, 49c.; Antigua and Barbados, 47c. to 49c.; St. Thomas and St. Kitts, 46c. to 48c. per ℔.
Grape Fruit—Jamaica, $1·25 to $1·75.
Limes—$4·00 to $5·00.
Mace—35c. to 42c. per ℔.
Nutmegs—15c. to 15¼c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—3⅞c. to 4c. per ℔.
Sugar—Centrifugals, 96°, 4·83c. to 4·86c.; Muscovados, 89°, 4·18c. to 4·21c.; Molasses, 89°, 4·06c. to 4·09c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 8, 1916.

Cacao—Venezuelan, $14·75 to $15·00; Trinidad, $15·00 to $17·25.
Coco-nut Oil—90c. per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$6·50 per 100 ℔.
Dhal—$6·75 to $7·00
Onions—$5·00 per 100 ℔.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 ℔.
Rice—Yellow, $6·75 to $7·25; White, $7·00 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., February 9, 1916; T. S. Garraway & Co., February 9, 1916.

Arrowroot—$5·00 per 100 ℔.
Cacao—$16·00 per 100 ℔.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 ℔.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $100·00 per ton.
Molasses—No quotations.
Onions—$12·00 per 190 ℔.
Peas, Split—$9·50 to $12·50 per 210 ℔.; Canada, $3·00 per 120 ℔.
Potatoes—Nova Scotia, $4·00 per 160 ℔.
Rice—Ballam, $6·30 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·65 to $3·80.

British Guiana.—Messrs. Wieting & Richter, January 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per ℔.	20c. per ℔.
Cassava—	$1·20	——
Cassava Starch—	$10 to $11	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	8c. to 8½c.	9c. per ℔.
Dhal—	$7·00 to $7·25	$7·25
Green Dhal	——	——
Eddoes—	$1·92 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·25	$3·25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92	——
Rice—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
Tannias—	$3·12	——
Yams—White	$2·40	——
Buck	$3·12	——
Sugar—Dark crystals	$3·60 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M
, Cordwood	$1·80 to $2·00 per ton	——

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A FORTNIGHTLY REVIEW

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Do Soil Explosions Pay?

DURING the last three years a considerable amount of attention has been given to the idea of soil improvement by means of the use of explosives. As with every newly introduced idea, there has been a tendency on the part of certain sections of the Press to ride it to death, and it becomes desirable on this account to see how far the recommendations put forward fall into line with the results of carefully conducted experiments.

In doing so, it may not be amiss to make brief reference to the general discussions on the subject that have come under our notice. An interesting and extremely well illustrated article is to be found in the *Agricultural Gazette of New South Wales* for January 1913, which suggests the great value of dynamite in clearing bush land. In this an account is given of the different kinds of explosives that may be used, and the methods of firing them, the latter being either by means of the safety fuse, or by electricity. It is indicated, in this article, that the advantages accruing from the felling of trees by dynamite lie, not only in the fact that the stump is removed, but also in the fact that the small limbs are broken off by the concussion, and fall. In another reference, in the *Cuba Magazine* for March 1913, attention is called to the value of explosives in the breaking up of hard-pan in citrus cultivations in Florida, where 4-oz. charges of 30 per cent. dynamite have been exploded under trees with alleged results of an eminently satisfactory kind. From the purely physiological aspect of soil aeration, the *Planters' Chronicle* (February 8, 1913) strongly advises a careful employment of this form of subsoil cultivation. Strong advocates, also, for the use of explosives are the editor of *Tropical Life*, and the editor of the *India Rubber World*. In a reference to the subject in the latter journal (for April 1, 1913) a point is made of the fact that the use of explosives should tend to destroy soil parasites, as well as being useful as a means of preparing holes in which to plant young rubber trees.

Many more references of a similar kind could be mentioned, but our object is to consider the results of practical experiments that have been made, especially in the West Indies. Useful trials have been made by the Agricultural Departments in Dominica, Trinidad and Antigua.

In one of the plots in the additional series of experiments in lime cultivation in Dominica, charges of dynamite were exploded in fifty-six holes between the young trees; but after the elapse of many months, no improvement could be observed in the condition of the trees. On another portion of the field, trees in a similar condition were treated in the same way, but after twelve months' time no improvement was observable. Judging from these and other experiments carried out by planters, no good effects can be discerned from the explosion of dynamite in lime cultivation. There may, however, be certain conditions, such as the close proximity of hard-pan to the surface, under which the use of explosives may be advantageous; but in a general way their use is not likely to be beneficial. One other experiment was tried in Dominica. When planting the plots, holes were made by dynamiting with a view to compare their efficiency for plants with those made with the spade. Each alternate row of holes was dynamited and the remainder were dug soon after. The holes were carefully filled in a few days before planting to allow time for sinking, and six months after preparation, planting was done. So far the plants growing in these differently prepared holes exhibit very little difference in appearance.

Turning to the experiments conducted by the Government in Trinidad, the recent Annual Report on the Department of Agriculture states that 'dynamite experiments have been conducted on banana soil, and the figures obtained appear to show that not only a larger number of bunches has been reaped from the dynamited plot, but also that there has been a larger number of seven, eight and nine-hand bunches, and consequently the average weight of the bunches from the dynamited plot is 20·4 lb. against 18·8 lb. from the undynamited plot. In regard to similar experiments with coco-nuts, both the dynamited and undynamited plots have made good growth. So far the undynamited plot is the better of the two.' In these experiments also, therefore, the results are not, on the whole, satisfactory.

In Antigua, trials have been conducted with sugar-cane. In these experiments, which were carried out on Delaps and Donovans estates, dynamite cartridges 2 oz. in weight were used, and were exploded 2 feet 6 inches below the soil. Plant and ratoon canes were experimented with in each case. On the first named estate, the variety of cane treated was White Transparent. The results obtained both in the case of plant and ratoon canes have indicated that dynamiting the fields under soil conditions such as obtain at Delaps is not productive of profit. The returns obtained from the controls and dynamite plots showed little divergence. At Donovans estate, slightly different results were obtained. Here, also, there was no gain obtained by dynamiting plant canes, and as a matter of fact, the not-dynamited plot gave a higher yield; but with the ratoon canes there was a very appreciable increase in the case of the dynamited plot, which may, at least in part, be put down to the effects of the explosions. The soil at Donovans estate is especially heavy with a clay subsoil, and a reason for the increased yield from the ratoons may be found in the action of the dynamite in opening up the subsoil. In these last mentioned experiments, the dynamited plot gave a yield of cane per acre of approximately 11 tons compared with 4 tons from the not-dynamited. The area of each plot was about $\frac{1}{8}$-acre. But the extremely meagre return of 4 tons per acre shows that the soil conditions of the plot must have been exceptionally bad, and the results obtained therefore with dynamite in this experiment, cannot be regarded as at all general in their application to the dynamiting of soil growing ratoon canes.

Taking a general view of the West Indian results, it would appear that the benefit that may be expected from the use of dynamite is more imaginary than real. As with manuring, so with soil explosions, the conditions obtaining in each case must be considered. It is probable that for breaking up the subsoil, and for removing a hard-pan, the use of explosives is worth while; but as a general operation in the routine of plantation management, it is not to be recommended on the basis of present experience.

Where it is intended to employ explosives, the object arrived at should be clear and definite. Otherwise more harm than good may result. One direction in which dynamite might possibly be used to advantage in the West Indies is in breaking up the large boulders of larva that occur in the fields in some of the islands. The removal of such obstructions in the places referred to would facilitate ploughing and cultivation generally.

Attention is being given to two essential oils in Fiji one of which is obtained from the roots of *Vetiveria zizanoides*, and the other from the leaves of lemon grass (*Cymbopogon coloratus*). The very vigorous growth of this latter grass in Fiji is a notable feature. Bay trees are stated to be growing well in Fiji and a certain quantity of bay oil, according to the report on the Agricultural Department, 1914, is prepared.

SUGAR INDUSTRY.

THE TRANSPORT OF SUGAR-CANE IN CUBA.

The area under sugar-cane in Cuba is not easy to arrive at, but, knowing the crop, and assuming the liberal figure of 25 tons of cane per acre, the area of the fields cut each year in Cuba will be approximately 1 million acres, or, say, slightly more than 41,000 square miles of the island's surface. Bearing in mind the large area occupied by uncultivated spots and roads and pasture, the total area from which the cane is drawn will be very nearly or quite double the acreage from which the cane is actually cut. Mr. J. A. Hall, Jnr., in the *Louisiana Planter* (February 8, 1916), gives an interesting article describing how on this large area the huge Cuban crop is transported. The canes are always taken from the fields to the nearest factory line in what are called bull carts, resembling in most respects the carts employed for a similar purpose in the British West Indies. They differ, however, in one important respect, namely, they are provided with wheels of very large diameter. These enable the cart to mount obstructions and climb out of holes that would effectually stop smaller wheels, while they can sink 2 feet or more in the mud and still have the hub and axle clear. These wheels are comparatively narrow, so there is little opportunity for collecting considerable quantities of mud: but, on the other hand, this narrow surface forms a cutting edge that is quick to make a deep impression on a new road, and is certain to keep an old one in bad condition. In this connexion the general practice of leaving a carpet of leaves and trash on the harvested fields is useful, in so far as it prevents the cart wheels from sinking into the soil, and protects the stubble from being injured.

These bull carts are loaded with 1 to 3 tons of cane, according to the condition of the roads, and are drawn by four or six bulls. As already intimated, they are in use on every plantation on the island, and handle at least 80 per cent. of the cane that comes from the fields, though, of course, on account of the fine railway systems, very little of this reaches the cane carrier in these vehicles. They are used principally for the comparatively short hauls from field to transfer station, where cane is loaded into the railway cars and carried to the factory.

Conservatively estimated, a cart and two yoke of bulls are worth in Cuba $500, and an outfit of this kind hauls an average of 6 tons of cane per day. The average Cuban factory grinds 1,000 to 1,200 tons of cane per day, requiring, therefore, 150 to 250 carts and 600 to 1,000 bulls, with a total value of $75,000 to $125,000.

The cane is cut into lengths of about 3 feet, and piled carefully into the carts by hand, in such a manner that chain slings may be passed beneath the bundle for lifting it into the railway cars by one of the modern types of steel derricks used for this purpose. These derricks are similar to the old-styled wooden, but their solidity and lasting qualities are much superior to those of the wooden apparatus.

All these loading devices, which can be seen along the railway lines, are operated by the same bulls that haul the cane from the fields. Quite a few plantations have experimented with hoists operated by gasolene-motors but which may also be operated by bulls in case of an accident to the engine. As a rule these gasolene-driven hoists have given fair satisfaction, but the general impression is that they can only be used economically where quantities of cane much above the average must be handle.

Following the bull carts in importance comes the equipment of a portable car, mainly used on the larger plantations where it takes the place of bull carts in some fields. The experience of the past crop, when so much rainy weather was had, was sufficient on account of interrupted grinding from lack of cane to prompt the largest orders for portable tracks that had been placed for some time Amongst the great advantages of these temporary light railway lines is the fact that they discount weather conditions to a very large extent,and enable cane to be transported under conditions where the use of the bull cart would be impossible. Further, these rail tracks release a great deal of pasture land for cane cultivation. On the other hand, the discarding of the cattle means less pen manure for the canes. On these portable tracks, the small cars are generally pushed by hand, in fact, they correspond with the tram lines of Eastern plantations. The portable track generally used in Cuba is the 24 or 30-inch gauge, made in sections that vary from 10 to 30 feet in length. The rails are usually fastened to cross ties of steel plate sufficiently light to permit the lifting of each section, but heavy enough to allow the cars to be operated safely, and at a satisfactory speed. Connexion between rail and tie is generally effected by means of bolts, one of the latest designs being illustrated in the article from which this information has been obtained. A very convenient type of track is one used on many estates, possessing the advantage of not needing wrenches of any kind to take the sections apart or to couple them together; the end of the rail of one section simply slides into the slice bar that is bolted or rivetted securely on the end of the other section. By this arrangement both time and labour are saved.

The *Louisiana Planter* goes on to state that only an insignificant amount of cane is handled by any means except the two described, but of late years several of the factories and manufacturers of agricultural implements have carried on experiments with apparatus with the idea of developing a system that will combine the flexibility of the bull cart with the dependability and capacity of the portable track. Principal among these experiments has been those with carts mounted on four broad tyred steel wheels. In some cases these carts are drawn by bulls, in others a number of carts are coupled together and pulled by a tractor. When pulled by bulls these steel wheel carts are loaded up to 6 to 8 tons, while one of the cars of a tractor train will take 5 tons. It is believed that the steel wheel cart and the tractor will eventually take the place of the old-fashioned wooden vehicle.

The subject of *Bulletin No. 291* contributed from the Bureau of Plant Industry, United States Department of Agriculture, is the breeding of millet and sorghum for drought adaptation. These two useful fodder crops have proved to be adapted to drought and capable of producing profitable crops where the annual rainfall averages so little as from 12 to 18 inches. The drought adaptation of millet is due largely to its early maturity and low water requirements, while sorgho has, in addition to these two valuable characteristics, a remarkable ability to withstand drought, that is to say, it can remain in a sort of state of quiescence and resume growth upon the return of favourable conditions. These two crops require less water for the production of 1 ton of fodder than any other crops that have been tested in the Central Great plains of the United States.

THE EFFECT OF LIGHTNING ON COCO NUT PALMS.

Mr. T. Petch contributes an interesting article to the *Tropical Agriculturist* (October 1915), on the subject of the effect of lightning on coco-nut palms.

That coco-nut palms may be killed by lightning is well known to all coco-nut planters. On the other hand, it is necessary to exercise caution in accepting that as an explanation of the death of trees in any particular case. It appears that in the East, the native as a general rule assigns the death of a palm to lightning always, whereas the cause very frequently is bud rot or red beetle (*Rhyncophorus signaticaillis*).

The damage inflicted on coco-nut palms by lightning may take any one or any combination of the following three forms: (1) The crown may be set on fire; (2) the tree may be mechanically injured, either by splitting of the stems or by defoliation; (3) the tree may exude liquid which dries in red-brown streaks and patches on the stem.

The last is by far the commonest effect of lightning on coco-nut palms. As a rule, there is no sign of injury to the stem or scorching of the crown, but the stem exudes at numerous points a liquid which dries in red-brown streaks and patches on its surface. In a case examined by Mr. Petch, the stem was not split or marked by the lightning in any way. Owing to the collapse of the inner tissues of the bud, the central spike had fallen over, but it was still green and not charred. The outer leaves, namely those which bent over towards the ground, were charred along the midrib; and round the tree, at distances of 8 or 10 feet from the trunk, the grass and weeds were burnt in small patches, each patch being situated below the point of the leaf. But the most striking phenomenon observed by Mr. Petch was the exudation of sap from the stem. Liquid was oozing out from the innumerable cracks which are always to be found in the rind of the coco-nut stem, forming white frothy masses and then running down in long red streaks. The appearance gave one the impression that the whole of the internal tissues were undergoing rapid fermentation. On cutting into the stem the internal tissues were found to be slightly pale brown, uniformally coloured, and full of sap. It is to be regretted that, as the tree was situated in a district at least three days' journey from a laboratory, no further investigation could be made. It is hoped, however, that the facts placed on record above may be taken up under favourable conditions for detailed investigation.

Another case was examined by Mr. Petch about a month after the occurrence. A breadfruit tree was said to have been actually struck, and this was dead and leafless though its trunk was not split. Close to it was a coco-nut palm about 12 feet shorter. This was not quite dead; it showed long red streaks of sap, particularly in the lower half of the stem, and had two short vertical wounds, one at 12 feet and the other at 18 feet from the ground, from which the vascular bundles were protruding in loose masses. Westward from these two, the palms only 15 feet away showed no sign of injury, but to the east, twenty trees, which were taller than the breadfruit tree were effected. Their trunks bore red bleeding spots and their crowns were scorched, the outer leaves being generally withered and drooping, though the youngest leaves were still erect and green. None of these showed any injury to the stem, except the exudation of sap Two palms had been felled, as being beyond recovery; four other appeared to be dying. The tree with the worst crown was about 20 yards from the breadfruit tree, and the effected area formed, roughly, an eclipse with the breadfruit tree at one focus.

No explanation of this fermentation effect can at present be offered. It may, however, be pointed out that the same effect may be produced on a small scale by making a fire near the base of a coco nut palm, but not near enough to char the stem. The red-brown patches subsequently appear on the parts which have been heated. The number of red-brown spots and streaks at the base of the tree, usually on on one side only, indicates that it had been injured by fire. As a rule on trees which have been injured by fire, the bleeding occurs immediately afterwards, and the spots do not subsequently increase in number or size. Only the cortex is affected, and the amount of sap which exudes is small. But when trees are severely struck by lightning, the exuding sap is derived from the whole of the inner tissues, and issues in such quantity that it runs down the stem in long streaks.

In conclusion Mr. Petch summarizes the effect of lightning on coco-nut palms as follows: 'A group of trees not differing in any obvious respect from the surrounding trees, is affected; sap exudes from the trunks of all these trees; their crowns are slightly scorched; one tree is more severely affected than the others, and this is regarded as the tree actually struck. In some cases longitudinal wounds are made in the stem; and if the crown is surrounded by dead leaves these may be set on fire. But apparently these last two affects are rare.' The occurrence of injured trees in groups is especially remarkable.'

The general opinion seems to be that coco-nut palms which have been struck by lightning may recover if properly treated. The treatment adopted by the native is to cut a hole in the stem in order to let out the excess of sap. There appears to be some reason to support this apparently crude procedure.

THE STATE OF SCHOOL GARDENING IN JAMAICA AND BARBADOS.

Two educational reports, one on Jamaica (1914-15), and the other on Barbados (1914), contain interesting information with regard to the standard and progress of school gardening work in those colonies.

As regards Jamaica, extracts are published from the Agricultural Instructors' reports on their visits of inspection during the year. Each district contains from twenty to forty gardens, and the general condition of these appears to be satisfactory. In some places operations have been rendered difficult on account of drought. For its successful working, a school garden must have access to a supply of water. Another factor militating against the successful working of these gardens in Jamaica is the provision of fences, which is very inadequate. These are necessary to prevent theft, but more especially to prevent small live-stock from getting in and doing damage. In the case of one or two of the Jamaica districts, the Instructors urge that more time should be devoted to budding and grafting, and that whatever work is done the educational value should be well kept in view by the teachers. The corn growing competition provided for by the Jamaica Agricultural Society has aroused a good deal of interest amongst the schools in connexion with this important industry. The competition is much appreciated and serves a very useful purpose; similarly the prizes offered by the educational department for the best gardens. It is stated that if more money could be devoted to this purpose, it would be money well spent.

Turning to a consideration of school garden work in Barbados, it appears that this has been carried on in a satisfactory manner, in spite of the loss of the grant placed on the estimates for such work. There has been no increase in the number of gradens during the year, but with the purchase of sites for schools there will be a larger number of plots cared for by the children. The Board is encouraging the planting of hedges by the children as enclosures of the new sites which are being purchased by the Board. These, it is pointed out, will both beautify the school grounds and serve as a protection for them. At the Local Agricultural Exhibition held at Fisherpond on December 2, 1914, there were 226 exhibits of school garden produce, and seventy-three prizes were awarded as against sixty-three in the previous year. All the exhibits were in good condition, and it was demonstrated that, on the whole, the work has received due care and attention at the hands of both teachers and pupils. In addition to prizes given by the Board, the Local Department of Agriculture presented two prizes for the best collection of exhibits.

In connexion with school garden work it may be mentioned that in the case of schools where facilities for working a garden are absent, a useful course of study can be carried on in Indoor Gardening. This idea was dealt with in an article in the last issue of the *Agricultural News*, and the scheme of instruction will be found there or in greater detail in Pamphlet No. 82 of the Imperial Department of Agriculture, which is devoted to the subject.

WEST INDIAN COTTON IN FIJI.

The islands of Fiji in the Western Pacific are endeavouring to establish a Sea Island cotton industry. This is a matter of some importance from a West Indian point of view, in connexion with the fact that at present the British West Indies is the only Imperial source of supply.

In the report on the Agricultural Department of Fiji for 1914, the results of plot experiments are given with seed obtained from Barbados, Antigua, and St. Kitts.

Before proceeding to give the results obtained, a few words may be said concerning the method of preparing the land for cotton in these experiments. This consisted in ploughing with a single disc plough in September. After one month's rest, the land was then harrowed, followed by a cross-ploughing. It was then again harrowed. For experimental purposes one plot in these experiments was ridged. To one plot stable manure and compost were applied, being spread in the drills and lightly covered before the seed was planted. Actual planting took place in these experiments during December.

Inter-cultivation consisted first in sending a scarifier down the space between the rows of cotton bushes, followed by labourers with hoes to attend to the weeds near and between the cotton plants which cannot be reached by horse implements. This operation combines weeding and a stirring up of the soil, the latter being particularly important in dry weather in order to prevent an undue loss of moisture.

Thinning of the seedlings out to one took place during the first month or six weeks. Subsequent cultivation consisted of weeding and stirring the soil. Weeding ceased at the end of February, and picking started about the middle of April and finished in July. During the early part of the year the weather was unusually dry, but fortunately, the weather following planting was satisfactory and enabled the young plants to get a good start. The Lautoka Experiment Station, where these experiments were carried out, is the driest of the four experiment stations of the Colony. Nevertheless it has an average rainfall of about 64 inches per annum. At Souva, the average rainfall is 110 inches. It would look, therefore, as if the climate of Fiji were rather too wet for the successful production of Sea Island cotton.

Before proceeding to give the yields obtained, it may be noted that the cost of growing cotton in Fiji ranges from about £6 10*s.* to £8 10*s.* per acre. The cost of growing 1 lb. of lint was 7·09*d.* for plot 4, 6·72*d.* for plot 5, and 6·31*d.* for plot 13. The cost of picking 1 lb. of seed-cotton was 1·41*d.* for plot 4, 1·14*d.* for plot 5, and 1·08*d.* for plot 13.

As already stated, trials were made with seed from Barbados, Antigua and St. Kitts. The germination of the Antigua seed was so poor that this plot had to be abandoned. As regards Barbados seed in which 3 acres were planted, the yield of lint per acre was 252 lb. From similar areas the St. Kitts seed gave 311 lb. of lint per acre on one plot, and 255 lb. per acre on another. The percentage of lint was greater in the case of the St. Kitts cotton than in the case of the Barbados cotton, namely, 28·4 in the case of the former against 27·7 for Barbados.

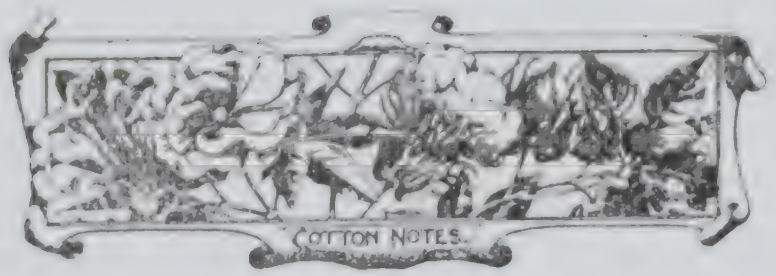
As already intimated, some of the land was ridged. It was found that there was no advantage to be gained by planting cotton on ridges.

As regards pests, it is stated that cotton stainers during the season under review gave no trouble; they are usually very plentiful towards the end of the crop and are destroyed in great numbers when the crop is ploughed out. It is not stated in the report how stainers are destroyed. In the year under review, their appearance seems to be considerably later in the year than usual, and they did not increase to nearly the same extent as in previous years.

It is stated that the cost of growing 1 lb. of lint compares very favourably with that of previous years. The cost of picking is stated to be high, because picking had to be completed with inexperienced labour. No trouble is experienced in Fiji in connexion with ginning.

As regards selection, it is stated that twelve plants are marked each year, the produce from which is kept in separate bags. When all the cotton is reaped from these plants the different lots are sent to Souva for examination In the present season seven lots were at once rejected as being distinctly inferior to the rest, which were very carefully examined. Fifty bolls from each sample were hand ginned, and the result in seed and lint weighed. The total crop was also weighed, the number of seeds counted and their value measured. The length and fineness of the fibre are examined, and care is taken to see that it is of fair strength. Two of the lots came so near one another that difficulty was met in deciding which one to select: one of them has a higher percentage of lint but a smaller crop than the other. The difference between the actual crops of these two was negligible compared with the difference between either of them and the ordinary yield under field conditions. The point was therefore decided upon by the percentage of lint rather than of crop. It may be mentioned of these two plants, that one gave ·76 lb. of seed-cotton with ·21 lb. of lint (27·5 per cent.), and the other 63 lb. of seed-cotton containing ·17 lb. of lint (28·1 per cent.). Planted at the distances used at Lautoka, if one or other of these yields was maintained by every plant, we should have enormous yields of 730 and 590 lb. of lint per acre.

It is stated in conclusion, that the seed of the selected lot are planted in a place by themselves, and at crop time the produce is kept by itself and ginned by itself, the machine being carefully cleaned previous to ginning, to prevent other seeds getting among those of the pure strain.



COTTON.

SEA ISLAND COTTON MARKET.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February, 12, 1916, is as follows:—

ISLANDS. There was some demand this week for the remaining crop lots, which were sold on private terms for export, and the limited offerings of odd bags were in demand on account of the Northern Mills, at prices ranging from 27c. to 30c.

The crop has been nearly all marketed and disposed of. The unsold portion consists of about 250 bales classing Fine to Fully Fine, which are held at 30c. and upwards, and two small crop lots held at full prices.

We quote, viz.:

Extra Fine	30c. = 19½*d.* to 20*d.*	c.i.f. & 5 per cent.
Fully Fine	29c. = 19*d.*	,, ,, ,, ,,
Fine	28c. = 18½*d.*	,, ,, ,, ,,
Fine off in class	27c = 18*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. The market was quiet and unchanged this week. The sales were largely composed of cotton received by exporters from the interior and reported in the sales. Factors in Savannah refused to lower their prices, and are continuing to hold at 30c for round lots grading from Choice to Fancy. As there have been no sales as yet on these terms, we renew our last quotations, but could buy with difficulty at them.

We quote, viz.:

Fancy	30c. = 31c.,	landed.
Extra Choice	29c. = 30c.,	,,
Choice	28c. = 29c.,	,,
Extra Fine	27c. = 28c.,	,,

The Exports from Savannah for the week were, to Northern Mills 409 bales, Southern Mills 103 bales, and to Liverpool 276 bales, and from Jacksonville to Northern Mills, 797 bales.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and forty-fourth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday February 1. In the absence of the President (The Rt. Hon. the Earl of Derby, K.G.) and of the Chairman, Mr. James Crinion occupied the Chair.

WEST AFRICA. In regard to the prospects for Lagos and Northern Nigeria, a cable has recently been received from the Association's manager in which he reports that the Lagos crop is excellent, and the prospects are auspicious. In Northern Nigeria the purchases of the new crop have exceeded those of any previous year, and the prospects are very promising.

The purchases of cotton in Lagos for the year 1915 amounted to 6,161 bales, as compared with 13,547 bales for 1914, 13,910 bales for 1913, 9,146 bales for 1912, and 5,408 bales for 1911. The purchases for the month of January are 155 bales, as compared with 39 bales for January last year.

The purchases of cotton in Northern Nigeria for 1915 were 1,128 bales, as compared with 695 bales for 1914. The purchases to January 22 amounted to 307 bales, against 23 bales for the whole month of January last year.

In view of the high price of cotton it has been decided to increase the buying price to the natives in West Africa from 1*d.* to 1⅛*d.* per lb. of seed-cotton, which is the same price that was paid before the War. It has always been the policy of the Association to pay the highest possible price, in order to encourage the natives to cultivate cotton.

SUDAN. Reports have been received from the experimental stations in the Sudan up to the middle of December. At all the stations the temperature has been very low during December, and it is not anticipated that the crop will show any increase over last year.

NYASALAND. The native cotton purchased by the Association from this season's crop is equal to 1,380 bales, of 400 lb. each, and the Association's manager reports that the Port Herald Ginnery will be fully employed until the next crop comes along. There has been a good demand for seed for the new crop, and it is considered that a larger acreage will be planted under cotton than in any previous year. A letter has been received from the Director of Agriculture stating that the cotton is of good quality, and the native-grown crop considerably exceeds the expectations of the Government, and there will be little, if any, decrease in the output of native cotton, which is satisfactory, considering the War, the Native rising, and the large amount of porterage undertaken by the natives in connexion with supplies for the troops. Rains are now breaking, and arrangements are being made for an increased distribution of cotton seed, and the agricultural Staff are actively spreading the industry. Owing to the deterioration in the quality of Nyasaland cotton there has been some agitation on the part of the European planters for the importation of American seed, but it was felt that whatever was done, the distribution of seed should be under the strict control of the Government.

Statement was submitted showing that 6,927 bales of cotton had been sold during the month.

ELEVEN YEARS' MANUIAL EXPERIMENT WITH COTTON IN ST. KITTS.

Manurial and other experiments with Sea Island cotton have been carried on in connexion with the work of the Experiment Station at La Guerite, and are a continuation of experiments conducted for the last ten years. (See Reports on the Botanic and Experiment Stations, St. Kitts Nevis, for 1904-5 to 1913-14—Cotton manurial and other experiments.)

The manurial experiments, which have been carried on for the last eleven years on exactly similar lines and on the same identical plots, consist of thirty plots, each $\frac{1}{10}$-acre in area, in duplicate, and are known as Series Nos I and II.

The manures are applied in accordance with the manurial scheme published in the *Agricultural News*, Vol. III, p. 237, and full reports of previous experiments have been published in the *West Indian Bulletin* (Vol. VI, p. 247, Vol. VIII, p. 283, Vol X, p. 269, Vol. XI, p. 60, and Vol. XII, p. 1).

The following table shows the mean results obtained:—

RESULTS OF COTTON MANURIAL EXPERIMENTS AT LA GUERITE, ST. KITTS, SERIES I AND II, OVER A PERIOD OF ELEVEN YEARS.

No. of experiment.	Nitrogen as nitrate of soda.	Nitrogen as sulphate of ammonia.	Potash as sulphate of potash.	Phosphoric acid as basic slag.	Cotton seed meal.	Average for eleven years. Seed-cotton lb. per acre.	Difference on No manure, lb.
1	No manure					1,213	
2	Pen manure					1,261	+ 48
3			30	40		1,199	− 14
4		20	30	40		1,283	+ 70
5		30	30	40		1,232	+ 19
6	20		30	40		1,345	+132
7	30		30	40		1,175	− 38
8		30	30	60		1,251	+ 38
9		20				1,118	− 95
10		30				1,238	+ 25
11	20					1,307	+ 94
12	30					1,154	− 41
Phosphate series							
13		30	30			1,251	+ 38
14		30	30	40		1,232	+ 19
15		30	30	60		1,240	+ 27
16		30	30	80		1,278	+ 65
17				40		1,102	− 111
18		30	30	40		1,241	+ 28
19		30	30	60		1,202	− 19
Potash series							
20		30		40		1,148	− 65
21		30	20	40		1,160	− 53
22		30	30	40		1,232	+ 19
23		30	40	40		1,249	+ 36
24			40			1,207	− 6
Cotton seed meal							
25					300	1,283	+ 70
26					600	1,308	+ 95
27		30			300	1,267	+ 54
28				40	300	1,301	+ 88
29			30	40	300	1,327	+114
30		30	30	40	300	1,289	+ 76

It will be observed that the mean of the two no-manure plots is 1,213 lb. seed-cotton per acre, while the average of all the plots is 1,236 lb., or practically the same, and only in one instance, plot 6, has there been an increase of 10 per cent. on the unmanured plots.

These results, extending over a period of eleven years, are of great importance, and deserving of attention. They tend to prove that under the conditions existing at the Experiment Station, with a loose and open soil, the application of artificial manures has not so far been attended with remunerative results.

These experiments are being continued in the coming season on similar lines, on the same plots.

NEW SERIES.

In addition to these plot manurial experiments of long standing, four manurial experiments $\frac{1}{5}$-acre in area were laid out on land that had been under cotton for the past ten years continuously.

These consist of the following:—

No. 1 No manure.
No. 2 Pen manure (20 tons per acre).
No. 3 Complete artificial manure, nitrogen as sulphate of ammonia 30lb., potash as sulphate 30lb., and phosphoric acid as basic slag 30 lb.
No. 4. Cotton seed meal 600 lb. per acre.

These experiments suffered from the unfavourable weather conditions of the season, and the action of the manure was not apparent in the returns of seed-cotton reaped.

The cotton was picked from October to end of December with the results as appear in the following table. It was at first intended to keep this cotton for a second bearing, but the land was required for another purpose:—

Plot 1 — No manure	— 111 lb. per plot	555 lb. per acre
Plot 2 — Pen manure	— 108 ,, ,, ,,	540 ,, ,, ,,
Plot 3 — Artificial manure	104 ,, ,, ,,	520 ,, ,, ,,
Plot 4 — Cotton seed meal	103 ,, ,, ,,	515 ,, ,, ,,

Cedar.—The import of cedar into the United Kingdom according to the *Annual Trade Reveiw*, January 1916, totalled 433,000 feet as against 534,000 feet and 703,000 feet in 1914 and 1913, respectively. The falling off is accounted for by the lesser quantities received from Honduras, Mexico, Trinidad, and Demerara, but this was off-set to a certain extent by an import of 108,000 feet from Argentina, whence none had come to hand in the previous twelve months. The market has been extremely active almost throughout the year, and the small supplies offered from time to time were readily absorbed at continually advancing rates. The German cigar-box supplies being eliminated, Dutch manufacturers have done a steady trade with this country, and owing to the difficulty of securing their raw supplies from the producing countries have been active buyers in the English markets. The stock to be carried forward to 1916 consists of 58,000 feet of Honduras, and as supplies are likely to be very short for some time ahead, the high prices now established are likely to rule for a considerable period, if indeed they do not advance still further.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number gives the results of experiments on soil explosions conducted recently in the West Indies.

On page 83 will be found an article describing the means of transporting sugar-cane in Cuba.

An interesting article on page 84 describes the effect of lightning on coco-nut palms.

Insect Notes deal with pests in Mauritius, and under Plant Diseases a malady of the mango is described.

Scientific and Industrial Research.

The Board of Education of England has recently issued a scheme for the organization and development of scientific and industrial research. This is the outcome of the strong concensus of opinion among persons engaged both in science and industry, that a special need exists at the present time for new machinery, and for additional State assistance in order to promote and organize scientific research, with a view especially to its application to trade and industry.

In previous issues of this Journal (Vol. XIV, pp. 289 and 401), we editorially referred to movements on foot to obtain Government assistance in giving scientific support to certain industries that have been seriously affected by the War; and to the lack of support which science receives from the Press generally.

The scheme now under consideration, and which has resulted from the movements referred to above, is not intended to replace or interfere with the arrangements which have been made or may be made by the War Office or Admiralty or Ministry to obtain scientific advice and investigation in connexion with the provision of munitions of war, but is designed to establish a permanent organization for the promotion of industrial and scientific research. To that end it provides, *inter alia*, for the appointment of a small Advisory Council whose primary functions will be to advise the Committee of Council (i) on proposals for instituting specific researches: (ii) proposals for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades: (iii) the establishment and award of Research Studentships and Fellowships. It is deemed essential that the Advisory Council should keep in close touch with all Government Departments concerned with or interested in scientific research, and act in intimate co-operation with the existing scientific or professional associations, societies and institutes, as well as with Universities, technical and other institutions in which research is or can be efficiently conducted. It is contemplated that the Advisory Council will work largely through sub-committees reinforced by suitable experts in the particular branch of science or industry concerned. A large part of their work will be that of examining, selecting, combining, and co-ordinating rather than that of originating. They will be at liberty to initiate proposals and to institute inquiries preliminary to preparing or eliciting proposals for useful research, and in this way they may help to concentrate on problems requiring solution, the interest of all persons concerned in the devlopment of all branches of scientific industry.

Manufacture of Copra in British Honduras.

Attention is directed to this new line of development in the British Honduras coco-nut-growing industry, by the Royal Society of Arts in their Journal for December 24 last. It appears that during the

eight months, January to August 1915, there were shipped from Belize 40,649 lb. of copra to the United States, and over 100,000 lb. to the United Kingdom, or more than the total shipments for as many previous years.

The meat of small coco-nuts, nuts broken in handling, and nuts that have sprouted, can be profitably used in preparing copra, and, unless the local market price of first-class nuts exceeds $14 (about £2 17*s.* 6*d.*) per 1,000, such nuts can be used as well. Copra is worth 4 and 5 cents (2*d.* and 2½*d.*) a lb. in Belize. A thousand nuts should yield 400 lb. of copra, but the fancy prices that have been paid for coco-nuts during the past six years forbade consideration of making the article; as much as $30 (£6 3*s.* 4*d.*) per 1,000 has been paid for coco-nuts in Belize.

According to the recent report by the United States Consul at Belize, the manufacture of copra in British Honduras is not very expensive, the meat extracted from the nut being dried in the sun in five or six days, or under cover in the rainy season. The copra is then ready for bagging or shipment. The oil, if at all tainted, can be profitably used in soap manufacture. First-grade oil is used in making a cheap but wholesome grade of butter, which is now used extensively in European countries.

Coco-nuts are being extensively planted in British Honduras. It is a very profitable industry, even when nuts sell at $12 (£2 9*s.*) per 1,000. Copra manufacture is, however, a new venture in the country, but one that will, in the Consul's opinion, succeed and increase. No attention was paid to it until this year.

The immediate, even though slight, effect on trade will be the demand for bags and bagging.

Hawaiian Soils.

In a bulletin, No. 40, of the Hawaiian Agricultural Experiment Station, issued in August 1915, there is an interesting account of investigations made as to the general properties of the soils of the Hawaiian Islands by the Chemist of the Station, W. P. Kelly, and his assistants, William McGeorge, and Alice R. Thompson. The practical bearings of these investigations with regard to cultivation are also pointed out.

It would appear that with the exception of small areas near the sea, the soils of the Hawaiian Islands arise from the disintegration of basaltic lava, resulting in a preponderating clay type of soil, which sometimes contains amounts of clay as high as 50 per cent. Hence proper drainage is essential in the management of soils of this type. The application of lime for the purpose of ameliorating the heavy clays has given but doubtful results. Investigations have also shown that fertilizers exert considerable physical effect. Phosphates materially retard the movement of moisture in the heavy clays, while nitrate of soda produces similar effects in some of the highly organic soils.

The predominant colour of Hawaiian soils is red, due to the presence of iron, often in large amounts. The potash content is rather below the average, but is frequently more soluble than usual, and consequently more available. Phosphoric acid is comparatively abundant, but with a wide range of variations in the percentages.

In the soils of these islands the humus content is high comparatively, and consequently the nitrogen is also high, but, owing to poor aeration, its availability is low. Hence in order to increase the availability of the nitrogen present the aeration of the soil, whenever possible, should be increased, thus improving the conditions for bacterial action on the organic nitrogen.

One of the peculiarities of Hawaiian soils is the presence in unusually high proportions of some of the rarer elements, notably manganese and titanium.

Hawaiian soils generally give an acid reaction towards litmus. The acidity sometimes indicates the need of large amounts of lime; but it seems that the slow growth of crops in these soils is due more to the lack of aeration than the presence of actual acidity. Lime has been used on the sugar lands with good effect. Soluble ferrous iron is considered to be toxic to plants, but the amount of ferrous iron soluble in water in Hawaiian soils is extremely small, except where there is insufficient aeration.

The practical bearing of these observations with regard to the cultivation of the Hawaiian soils seems to be that the essential operations consist of:

1. Thorough drainage.
2. Deep ploughing followed by frequent shallow cultivation.
3. Intelligent rotation of crops.
4. Frequent ploughing under of green crops.

These if carried out materially lessen the need for commercial fertilizers.

Sugar-cane that Outgrew Itself.

In the *Journal of Heredity* for February 1916, is printed a photograph from H. B. Cowgill, plant breeder of the Insular Experiment Station, Rio Piedras, Porto Rico, illustrating an unusual abnormality in sugar-cane. The subject of the illustration was taken from a seedling cane which was grown in Porto Rico in the year 1913. The photograph shows four complete internodes or joints of a stalk: each of these joints has, as usual, a bud growing from it. But in every case, it is observed, this bud is traversed squarely across the middle by a great fissure. All the stalks of this seedling showed this abnormality on many of the internodes. As may be seen, it is a rupture of the outer pertion of the stalk across the centre of the bud. Seedling canes frequently show peculiarities, but this is the first time Mr. Cowgill has known this particular abnormality to happen. It seems to have been caused by an unusual formation of the bud. In sugar-cane the point of the bud is usually free from the stalk, but in this case it adhered closely to the stalk and seemed to have grown fast to it. The bud within evidently developed faster than the stalk, white its outer scales could not do so on account of being fastened to the latter. The pressure produced seems to have been sufficient to rupture the stalk. It was not possible to make any test to determine whether this abnormality would be inheritable.

INSECT NOTES.

INSECT PESTS IN MAURITIUS.

The Annual Report on the Department of Agriculture: Mauritius, for 1914, contains a report on the work of the Division of Entomology for that period from which the following notes have been extracted.

INSECT PEST OF SUGAR-CANE.

The pink borer (*Sesamia nonagrioides*), the spotted borer (*Diatraea striatalis*), the white borer (*Argyroploce schistaceana*), and the white grub *Lachnosterna* sp., which, associated with the rhinoceros beetle (*Oryctes tarandus*), caused serious damage to canes on a small area, where it was kept under control.

The pink borer caused injury to 'virgin' (plant) canes in damp localities. Satisfactory results in its control have been obtained by the use of maize as a trap crop. An efficient egg parasite (*Ceraphron beneficiens*) has now been discovered in the island. The eggs of the pink borer are conspicuous and easily collected, and by selecting and saving from destruction the parasitized eggs, it is expected to increase the efficiency of this useful insect.

PESTS OF FOREST TREES.

The insects recorded as attacking forest trees were three in number: a pyralid moth severely attacked young plantations of mahogany trees; 'illipe' trees suffered much from attacks of a longicorn beetle (*Phelematium femorale*), and 'Bois Noir' (*Albizzia Lebbek*) was again reported as being badly attacked by *Batocera rubra*. (This is of interest in connexion with the recent appearance of this insect in the West Indies, where *Albizzia Lebbek* is of common occurrence, (see *Agricultural News* for February 26, 1916).

A considerable number of pests were reported as Garden Pests; these are mostly of little interest in the West Indies.

The insects affecting stored grains were dealt with in a separate bulletin

Under the heading of Leguminous Crops, the 'Pois sabre' borer (*Argyroploce rhyncias*) was recorded as having been very destructive, and causing the wholesale destruction of several fields of the crop. It may be possible to control this pest by hand picking the eggs.

INSECTS ATTACKING DOMESTIC ANIMALS.

The poultry flea (*Sarcopsylla gallinacea*). In a poultry run infested by this pest, spraying with kerosene and Phenyl mixture at 1 per cent. was successful in controlling the pest.

The ticks were thoroughly investigated, specimens were received from all parts of the island resulting in the identification of six species. The host distribution was as follows:—

Amlyomma variegatum on deer, cattle and goats.
Rhipicephalus sanguineus on cattle and dogs.
" *evertsi* " " " "
Margaropus annulatus, var. *decoloratus* on cattle.
Amblyomma sp. on cattle.
Argas persicus on fowls.

Three of these species. *Rh. evertsi*, *Rh. sanguineus* and *M. annulatus*, var. *decloratus*, are the well-known carriers of dog and cattle piroplasmosis (jaundice and red-water fever).

A dipping tank has been erected during the year on one estate. The results have been most satisfactory. Ticks have decreased in numbers, and the general condition of the cattle has improved.

THE BROWN HARD BACK (*Phytalus smithi*).

This insect continued to be captured and collected in enormous numbers, the total number of beetles being 38,816,417, and of larvae 6,694,300, making a grand total of beetles and grubs of 45,510 717.

In spite of the increasing numbers of this insect destroyed from year to year the infested area is not found to be increasing. It is stated, however, that more stringent measures against this pest will have to be taken in the near future, and infested estates will have to be called upon for further assistance in the campaign.

Another consignment of *Thiphia parallela* was received from Barbados, but no parasitized Phytalus larvae had been found in the field.

RATS.

Specimens of a rat have been received from Mr. W. R. Forrest in Antigua, and these were submitted to the authorities at the British Museum, Natural History, by whom they were identified.

The note accompanying the first specimen was as follows: 'I send a specimen which I take to be a mature species; it is called by some a rat by others a mouse. It seems to be very common in town (St. Johns), lives in holes in mason work, etc.'

In a letter recently received from Dr. G. A. K. Marshall, Director of the Imperial Bureau of Entomology, through whom the material was forwarded for identification, it is stated that the specimens represent the common black rat (*Epimys* [Mus] *rattus*) while the larger rat which was referred to as also being common in St. Johns is probably the brown rat *Mus norvegicus* = (*Mus decumanus*).

The *Cambridge Natural History* (Mammals, p. 472) states in regard to these two species: 'The black rat (*M. rattus*) is like a large mouse, and is smaller and blacker in colour than "the Hanoverian rat". It is sometimes called the Old English rat, but seems nevertheless to be not a truly indigenous rodent. It has been so defeated by competition with the Hanoverian rat that it is now not a common species in this country' (Engiand).

'The Hanoverian or brown rat (*M. decumanus*) is a larger and browner animal than the last. It is very widely distributed through the globe, no doubt on account of the fact that it is readily transported by man. . . . The original home of the brown rat is thought by Dr. Blanford to be Mongolia. There is so far a justification for the name Hanoverian rat that the animal reached this country (England) about the year 1728. But there seems to be no reason for calling it, as is sometimes done, the Norway rat.'

It would appear that the black rat whether indigenous to the American Continents and islands or not was to be found in the New World previous to the advent of the brown rat. It is known that in many localities the black rat has been completely driven out or exterminated by the larger and more ferocious brown species.

The occurrence of both species commonly in the same town, as at St. Johns, Antigua, may indicate that in this instance the brown rat is of fairly recent introduction, and that for some reason or other the black rat has been better able to maintain its numbers than it has in certain other situations.

In Barbados, both species are present, the brown rat being the more abundant, occurring throughout the island, living in buildings, in trees, and in cane fields, where at times it is responsible for a considerable amount of injury to the sugar cane plants. The black rat appears not to be of common occurrence in sugar-cane fields, in Barbados.

SCIENCE AND COLONIAL AGRICULTURE.

The appearance in *Nature*, the leading British scientific journal, of the following article reviewing an editorial in the *Agricultural News* (September 11, 1915), is important from the point of view that it shows that the scientific world at home follows and realizes the importance of agricultural work in the tropics. It will be seen that on one or two points the reviewer differs from us. It is unnecessary to comment on these criticisms further than by saying that, the points are such as are open to argument:—

An article in a recent number of the *Agricultural News* (Barbados) discusses the probable effects of the War upon the organization of science from the Imperial point of view in relation to industry generally, and in particular to Colonial agriculture. This subject has been dealt with so exhaustively on all sides during the last twelve months that it would seem impossible to advance any new ideas about it, but the writer of the article selects two fundamental causes as responsible for the state of affairs prevailing until recently. He believes that the British character includes a keen appreciation of mechanical invention, without any appreciation of the scientific research underlying it. The second reason is that science as a profession is considered by the older universities and public schools as lacking in the essentials of refinement, and that this social stigma deters able men of good position from entering it. But this deduction is surely incorrect; the true explanation lies in the fact that the prizes that science can offer are so meagre compared with those held out by other professions. The social question is merely a secondary effect. This aspect of the matter was referred to by Sir William Tilden, speaking as a representative of the Royal and Chemical Societies at a deputation to the Government a short time ago.

While in the case of manufacturing industries individual enterprise in recognizing the true value of scientific work, can, and actually has, achieved much, practically nothing can be done in relation to agriculture without organization. No single farmer can afford to employ an expert to advise him on the scientific cultivation of his land, nor can any single scientific worker, however able, cope with more than a few of the varied problems that practical agriculture constantly presents. For this reason agricultural science is, in most countries, much more highly organized than any other of the applied branches. We do not think there are serious grounds for the fear expressed by the *Agricultural News* that in the general move to help the manufacturer British and Colonial agricultural science may be neglected. The Imperial Government seems to be alive to the importance of encouraging agriculture in all its branches within the Empire, and while some alteration of methods may be necessary, it is unlikely that any permanent reduction of scientific work will occur.

It is interesting to learn that in the West Indies there is the same lack of intelligent contact between the actual producer and the scientific worker that is still too obvious at home. There is also a need of more frequent intercourse between the agricultural experts, which is hindered by the natural difficulties of communication among the islands, and now almost impossible owing to the war. An optimistic view is taken of the future; it is hoped that the brighter outlook for science will attract more men of the best type, and that in the renaissance of science throughout the Empire agriculture will play its part.

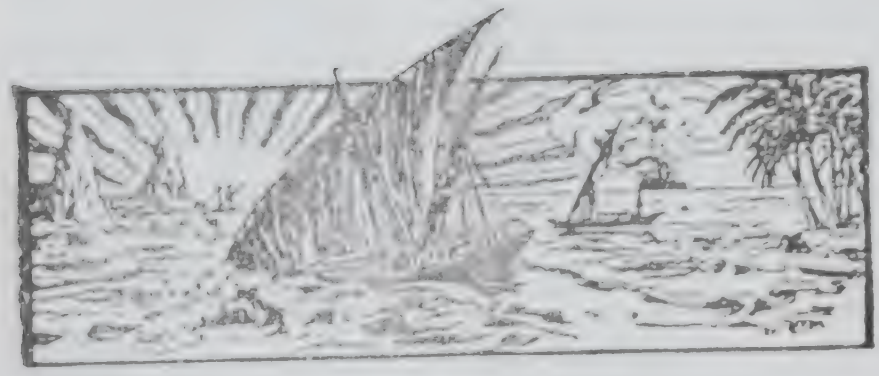
THE BEST CROPS TO GROW FOR PIGS.

In connexion with the suggestion made in previous issues of this journal that a larger number of pigs should be raised in the West Indian islands, the information given in *Circular No. 3* (1915) of the Louisiana State Univeristy and Agricultural and Mechanical College is useful, and may be briefly summarized.

In Lousisiana most of our common provision crops are grown during the summer, and many of these are found suitable and profitable in the feeding of pigs. Sweet potatoes have been found especially satisfactory. The writer of the Circular considers these as pre-eminently the best root crop for hogs for autumn grazing. It is the firm conviction of the writer that by means of a combination of sweet potatoes, peanuts and cowpeas, the most profitable hogs in the United States may be produced. Generally, in feeding peanuts, it is the custom to add a small amount of corn in order to balance the ration. An acre of peanuts in Louisiana will feed eight to ten hogs for thirty days or more, when the hogs weigh in the neighbourhood of 200 ℔. As regards cassava, the writers do not think that this is a very suitable crop for pigs on the average farm, but to lend variety to the feeding, there is no harm in planting a small area. Cowpeas make exceedingly good pasturage for hogs. These are usually planted in corn. Hogs may be allowed to gather both the corn and the pea crop profitably if portable fences are used. As regards pasture for pigs in Louisiana, the writer strongly recommends Bermuda or devil's grass, which is common in the West Indies. In Louisiana it is the practice to plant tufts of grass and then sow broadcast white clover seed at the rate of 4 or 5 ℔. per acre. Clovers do not grow in the tropics, but it would be easily possible to substitute some other leguminous plant which would enrich the feeding value of the pasture and augment the nitrogen content of the soil.

While on the subject of the best crops to grow for pigs, we may refer back to an article which appeared in this Journal, and more fully in the *West Indian Bulletin*, on the production of pork and bacon as a new industry for the West Indies. In this Dr. Watts states that it may be found profitable to feed pigs on sugar-cane, but in any case there are abundant lands for producing Guinea corn, pigeon peas, sweet potatoes, cassava, beans and maize. The raising of proper rotation of crops for feeding pigs is an important matter which ought to receive careful consideration in the West Indias.

Dr. Watts also calls attention to the fact, that there are many by-products and waste products in West Indian agriculture which might be used with advangtage in pig raising. In the first place there is molasses, which is produced in such large quantities that its disposal in a profitable way is becoming increasingly difficult. Another waste product of sugar factories which may be used to great advantage as food for pigs is the filter-press cake, which contains a considerable quantity of protein and sugar. Attention may be called also to the waste materials of arrowroot works, and the refuse lime skins of lime juice factories which are readily eaten by pigs; also to such materials as bananas, large quantities of which are unable to be shipped; and to coco-nut by-products and many other substances at present wasted. In conjunction with coco-nut estates the raising of pigs ought to be found especially convenient, for, as is pointed out in a recent issue of *Tropical Life*, the animals can be fenced in, using the trees as stakes, and there they can be fed on well drained land under shade with abundant oil cake, a by-product of the trees which shelter them. Altogether there can be no question that there are great prospects before organized pig production on tropical plantations.



GLEANINGS.

We learn from the Trinidad *Mirror* for January 24, that during the month of December last, 129,716 lb. of balata was exported from Demerara, 11,210 lb. going to the United States, and the balance to the United Kingdom.

In the *Annals of Tropical Medicine and Parasitology*, Vol. IX, No. IV, there is published a paper on a disease which affects most domestic animals, known as Babesiasis. It occurs on the West Coast of Africa, and is caused by a species of Piroplasm. It is understood that the disease is spread by ticks and tetse-tetse flies.

It is stated in the Trinidad *Mirror*, February 5, that an American syndicate has bought 10,000 hectares of land from private owners, and 20,000 hectares from the Government of Porto Rico, with a view to developing the banana trade. Already 16,000 hectares have been planted and a line of steamers has been established. It is inferred that the syndicate is the United Fruit Company.

The progress of the hookworm campaign in St. Lucia is dealt with in the *Voice of St. Lucia* for February 12. During 1915 there were examined 4,501 people. Of those examined 1,590 or 35·5 per cent. were found to be infected. The number treated was 1,488, and 1,119 or 82·3 per cent. were cured, 194 remaining under treatment at the end of the period under review.

The figures showing the exports of rubber from the Federated Malay States for December last, established a new record for one month's export, while the total for the year, which shows an increase of 13,827 tons over figures for 1914, establishes a record for the exports during one year. The big demand for rubber has been a direct consequence of the war. (*The Board of Trade Journal.*)

Reference is made in a recent issue of the *West India Committee Circular* to the experimental work that is being conducted with coco-nuts in Porto Rico. It does not appear that any very remunerative results have been got from the application of artificial manures. In connexion with selection work, records are being made showing the constancy in shape and size of both husks and nuts borne by individual trees.

There is evidence in the *International Sugar Journal* for November 1915, to show that it is of importance to study the question of the direction of the lines of cultivation in the planting of crops, since local conditions, such as proximity to mountains and large areas of water, exert a considerable influence. It has been found that with beetroot, lines planted east and west give bigger yields than lines running north and south.

An almost extinct relative of the cultivated cotton is the Kokio tree of the Hawaiian Islands. In the *Journal of Heredity* for January 1916, is an article giving some interesting facts concerning this notable plant. Seeds have been distributed to the different Botanic Gardens of the world in an attempt to save it from extinction. Whether it will cross with the cultivated cottons, and what the hybrid would be, are yet unknown.

We learn from the *Journal of the New York Botanical Garden* that Mr. A. S. Hitchcock, Systematic Agrostologist, United States Department of Agriculture, visited the Garden last November for the purpose of studying the West Indian grasses in the garden herbarium. Our readers will be aware that Mr. Hitchcock has already made a large number of determinations of St. Lucia and Dominica grasses, and hence the continuation of his work is of direct interest and value to these islands.

Banana growers in the West Indies will find of interest an article on the cultivation of bananas, which appears in the *Agricultural Gazette of New South Wales* (November 1915). Various matters in regard to planting are dealt with, and figures are given to show what returns may be expected in New South Wales. From an area of 12 acres during 1914, a net return of £362 9*s*. 10*d*. was obtained. Banana planting would therefore seem to be a profitable occupation in Australia.

Reference is made in the *Agricultural Gazette of New South Wales* for October 2, 1915, to a plant called Tagasaste, which is a shrub belonging to the pea family and known as *Cytisus proliferus*. There are three varieties. It appears that the variety palmensis is superior to the others as a fodder plant. It is found in the Canary Islands off the north-west coast of Africa, and in the above journal, Mr. G. A. Maiden, the Government Botanist to New South Wales, makes a plea that it should be given a fair trial in Australia.

A letter has been received from the Government Veterinary Surgeon, St. Vincent, enclosing information concerning a live-stock credit plan. The principle is that a company purchases improved live-stock for farmers. No actual money is paid over, the business men simply allowing the use of their credit. For St. Vincent it is suggested that the Government should buy stock and that the money should be refunded in the form of instalments. Such a plan was adopted in Barbados some years ago when Dr. Shannon was sent to the United States to purchase stock.

A shortage in nitrogenous manures seems to be anticipated in Great Britain. The *Gardeners' Chronicle* for December 25, 1915, says that manufacturers of phosphatic manure are unable to procure sufficient quantities of sulphuric acid which is in demand in munition work. In an article in *Nature* for December 2, reference is made to a possible shortage of nitrate of soda, owing to communication with Chile being interfered with by the landslide in the Panama Canal. It is understood that action has been taken by the Government to secure an adequate stock. Nitrate of soda is of course used in enormous quantities in the manufacture of munitions, and even in agriculture the consumption in Great Britain is not under 100,000 tons per annum.

CO-OPERATION BETWEEN AGRICULTURAL DEPARTMENTS AND CO-OPERATIVE CREDIT SOCIETIES.

The question of closer contact between Departments of Agriculture and Co-operative Credit Societies is receiving attention in India. A resolution passed at the seventh meeting of the Board of Agriculture held at Pusa in November 1911, ran as follows:—

'The Board is of opinion that the time has come for considering the question whether the Agricultural Department should not work in closer touch with the co-operative credit movement, as the object of both is identical, viz., the improvement of rural economy.' The Agricultural Department therefore after consulting the Registrar, Co-operative Credit Societies, decided the lines on which the Registrar could best co-operate with the Director of Agriculture. The lines of action tentatively agreed upon were as follows:—

(1) Dissemination of Literature.

The Registrar, Co-operative Credit Societies, will send the Director of Agriculture a list of societies to whom he wishes copies of agricultural leaflets and other literature to be sent. These societies will assist in making known to the cultivators the contents of the leaflets.

(2) Financing Agricultural Improvements.

This will take two forms:—

(a) Societies will be started to take up special work, such as improved methods of sugar-cane cultivation, e.g., advances will be made to members to meet the cost of improved methods of cultivation such as the cost of manure, etc. The advance will be recovered after harvest.

(b) Existing societies will finance and encourage in special areas proved improvements such as the introduction of ground nut in Nawada Sub-division, Gaya.

(3) Co-operative Credit Societies will be recognized by the Agricultural Department as agencies (just as Divisional and District Associations are) for spreading any improvements the Department wishes to introduce such as two-seedling transplantation of paddy.

(4) Central Banks and Honorary Organizers will be requested to assist in starting and controlling seed farms for—

(a) growing of pure seed.

(b) distribution of pure seed.

(5) The Divisional Agricultural Inspectors will be requested to attend the annual meetings of Central Banks (of which the Registrar will give timely notice to the Agricultural Department) and will at such meetings give advice and illustrative lectures to the members and, if possible, will give an exhibition of the working of new and improved implements, etc.

(6) The auditors of Co-operative Credit Societies will be requested at the time of audit to see whether the agricultural literature has been received and read at monthly meetings.

(7) Central Banks will be requested to select a cultivator to undergo a short course of six months' training at Sabour. The bank will be asked to pay the boarding expenses of the cultivator, and the Agricultural Department will make no charge for the course.

(8) Bank clerks will undergo a short six-monthly course of training at Sabour sufficient to enable them to work in communication with Divisional Inspectors.

The two departments are since 1911 tending to work more closely together, but much has not been done, nor can any notable results be expected until the expert and subordinate inspecting staff of the Department recently sanctioned, settle to their work.

The work hitherto done or going on in this connexion are:—

Agricultural leaflets in English and in the vernaculars, and other agricultural literature were distributed to selected societies for the use of the members.

A seed store has been opened at Sabour where selected and improved varieties of seeds are kept for sale to the cultivators and members of agricultural associations and co-operative societies. A seed store and museum has recently been open at Muzaffarpur under the auspices of the Tirhut Divisional Agricultural Association, where improved varieties of seeds, manures and implements are kept for sale and exhibition; and are supplied on favourable terms to the members of the Co-operative Society in Muzaffarpur District.

The institution of a short course in agriculture at the Sabour College affords the members of societies an opportunity of sending their members for such training. The prospectus of this short course was sent to the selected Central Co-operative Banks, and one Bank Clerk has already joined at Sabour.

The co-operation of Central Banks and selected societies is sought for to facilitate the introduction of improved varieties of seeds and implements.

The Professor of Agriculture at Sabour, at the suggestion of the Registrar, Co-operative Credit Societies, is taking an interest in the Co-operative Societies near Bhagalpur. He has recently become one of the Directors of the Central Co-operative Bank there and has already inspected some of the societies. Steps are being taken to make the Assistants and the Inspectors of the Veterinary Department and the Agricultural Inspectors acquainted with Co-operative methods. The Inspectors of the Patna, Tirhut and Orissa Divisions are to be trained with selected auditors under the Registrar of Co-operative Credit Societies.

A co-operative dairy society has been recently established at Gaya by the Registrar under the auspices of the Gaya Municipality. It is reported that the society is succeeding and is unable to meet the demand for pure milk. The question of growing fodder crops for use during the cold weather and siloing green fodder for the hot and dry months is being enquired into by the Agricultural Department.

It is hoped to use Co-operative Societies largely for the distribution of pedigree breeding bulls from the Government Cattle Breeding Station at Sipaya. A scheme has for some time been under consideration, under which District Boards will offer an Approved Society the whole or part of the cost of a bull, the Society providing the whole of the cost of the maintenance of the bull. Five bulls are now available for early distribution, and some of the District Boards have come forward to purchase them for the Co-operative Credit Societies under the above-mentioned scheme.

It is intended to do much more in the near future than it has been possible to do in the past to bring the societies into relations with the department.

Similar co-operation in many of the directions indicated should be possible in the West Indies.

PLANT DISEASES.

A MANGO DISEASE.

In the *Bulletin* of the Department of Agriculture of Trinidad and Tobago, Vol. XIV, pp. 164-71, Mr. J. B. Rorer, Mycologist to the Board of Agriculture, discusses the anthracnose of the mango, a disease whose existence is recorded in Florida, Porto Rico, Cuba and Trinidad, and which probably occurs to some extent throughout the West Indies. It has not, in any instance of which the present writer is aware, attracted much attention in the lesser islands, though no doubt it has had some influence, there as in Trinidad, in determining whether a year shall be a good one or a bad one for the mango crop.

The fungus is of the Gloeosporium or Colletotrichum type (a given fungus may adopt the form characteristic of one or the other of these genera, according to circumstances), and the author adopts the view that *G. mangiferae*, the name given to the fungus on the mango, is synonymous with *C. gloeosporioides*, applied to the form on citrus and other fruit trees.

The fungus attacks flowers, leaves, and fruit. On the flowers and flower stalks the fungus appears in spots, and leads to the blackening and dropping of a proportion or all of the flowers. It is in this way that most effect is produced on the crop. On the leaves, spots and sometimes holes are produced, which begin as minute black dots and increase to a diameter of $\frac{1}{8}$ or $\frac{3}{16}$ of an inch. Young fruits may be attacked and drop in large numbers, older fruits become spotted with black, or streaked, and their keeping qualities are greatly reduced.

Infection experiments with pure cultures resulted in the copious production of the various forms of the disease on the inoculated plants, while the controls remained nearly or quite unaffected.

Considerable interest attaches to the spraying, storage, and shipping experiments conducted over several years in Trinidad, the results of which are collected in the paper under review.

In 1912 trees of nine varieties bordering a road in the Experiment Station were made the subject of an experiment on the effect of Bordeaux mixture, twenty-one being sprayed and fifteen left as controls. The former received three applications in February, three in March, and one in May. February and March were dry months, so that the general mango crop was an excellent one, but the effect of the treatment was nevertheless shown in a much heavier crop on the sprayed than the unsprayed trees, especially the more susceptible varieties. The fruit was moreover very much improved in appearance. In 1913, though the weather was again not such as to favour any very serious manifestation of the disease, the beneficial results were even more noticeable, and were seen in the foliage as well as in the fruit.

The shipping of sprayed and unsprayed fruit to England and the United States has revealed an improved keeping quality as a result of the treatment. Fruit of the Julie variety, kept for a month in cold storage in Port-of-Spain, deteriorated much more quickly after removal in the case of unsprayed than of sprayed examples.

W. N.

WATER LOSSES FROM PLANTS AND SOIL.

A lengthy paper on transpiration appears in the *Journal of Agricultural Research*, United States Department of Agriculture, Vol. V, No. XIV. The paper has special regard to transpiration rate on clear days as determined by cyclic environmental factors such as radiation, air by temperature, and wind velocity. By way of introduction it is stated that the great differences exhibited by the various plants in water requirement, that is, in the water transpired in the production of a unit of dry matter, are of profound economic importance in the agricultural development of regions of limited rainfall, and an understanding of what gives rise to the greater efficiency which some plants possess in the use of water is highly desirable in the selection and breeding of plant strains adapted to dry land agriculture. This problem led the writers of the paper under notice to undertake a series of transpiration measurements with a view to determining, so far as possible, the relative influence of various environmental factors on the transpiration of different plants. To this end simultaneous automatic records were obtained of the solar radiation intensity, the depression of the wet bulb thermometer, the air temperature, the wind velocity, and the evaporation from the free-water surface. The paper under notice deals with the transpiration response of plants to these factors, on clear days.

Composite graphs are presented showing the mean hourly transpiration rate for each of the plants considered, together with the mean hourly values of the radiation, air temperature, wet bulb depression, and wind velocity for the transpiration period, and also the mean hourly evaporation rate. On the basis of the form of the curves, the transpiration graphs may be grouped into two classes having characteristic features. It should be mentioned here, that in this investigation only crops that grow in temperate climates were dealt with, with the one exception of sorghum. This however does not detract from the scientific interest of the results. The cereals showed a marked change in the slope of the transpiration graph in the forenoon unaccompanied by corresponding changes in the environmental factors. On the other hand, the forage plants gave little or no indication of such a change. This flattening of the graphs in the case of the cereals appears to be due to some changes in the plant, resulting in a reduction in the transpiration rate below what would be expected from the form of the curves during the early morning hours.

The paper concludes with a statement as to the form shown by the curves representing the cyclic factors. The radiation graphs are practically symmetrical with respect to noon. The air temperature and wet bulb graphs are very similar in form, since the latter can be determined from the former on days in which the humidity of the air is not changing. The transpiration graphs usually rise and always fall in advance of air temperature.

It is shown finally that radiation, air temperature, and wet bulb depression are correlated with transpiration approximately to the same degree. If the environmental factors are considered as independent, their relative influence on transpiration may be determined by the method of least squares.

Leaving the above subject and turning to the question of the movement and loss of water in soils, attention may be called to an interesting paper appearing in Vol. V, No. XIV, of the journal referred to above, entitled 'The Effect of Temperature on Movement of Water Vapour and Capillary Moisture on Soils'. This investigation has led to some interesting conclusions, one of which is that the capillary movement of water in moist soils is not controlled entirely by the curvature of the capillary films, as is generally believed, but also by the unsatisfied attractive forces of the soil for water. Other results are that the amount of water lost from the soil by water vapour is very small; that is, that there is no rising of vapour during the night from the warmer soil below to the cold soil above, and that the water of the dew is not derived from the soil vapour as is commonly believed.

Another paper in the same issue deals with soil temperatures. It is stated as a general conclusion that in temperate countries a system of clean cultivation with a winter cover crop is characterized by extreme diurnal and annual fluctuations in soil temperature. A straw mulch equalises these fluctuations to a marked extent, as does also a grass crop, though in a less degree.

WASTE LAND AND LOGWOOD.

An effort is being made by the Agricultural Department in St. Lucia to encourage the utilization of some of the waste land, particularly that adjacent to the coast, for the cultivation of logwood. Mr. A. J. Brooks, the Agricultural Superintendent, has prepared a leaflet on the subject which gives very useful information. In this it is pointed out that the logwood industry was at one time a very appreciable one in St. Lucia, the value of the exports being worth no less than £71,111 in 1893. The value of the annual exports now, however, has fallen to about £4,000. One reason for giving attention to the planting of logwood lies in the fact that the market value of logwood is at present high on account of the disruption in the aniline dye trade. At the same time the question as to what the future prices for dyes will be, is an open one. It must be remembered that very strong efforts are being made in the direction of producing aniline dyes in England, and after the war the demand for vegetable dyes is certain to be very much less than it is under the present disturbed condition. There is however a special demand for logwood dye, and in a general way its extended cultivation in the West Indies may be advocated, provided it is only grown on soils where other crops cannot be profitably produced.

Commercially there are two varieties of the logwood. The first is the valuable variety, the one producing the greatest quantity of dye. This is known as 'red' logwood. The second variety is not valuable, and is known as the 'bastard' logwood. The wood of the useful variety when split through the middle shows a deep red colour throughout, and when a few chips are placed in water it quickly becomes discoloured. The freshly cut surfaces of the wood of the valuable kind darken quickly upon exposure. On the other hand, the useless variety emits a strong odour when cut, and the surfaces do not darken upon exposure.

The best time for planting seed in St. Lucia is in February and March. A careful search should be made for the most vigorous matured trees yielding the highest percentage of dye. Before gathering the seed special care should be taken to see that the tree produces the wood desired, and this is readily done by chipping away a small portion of the sap wood from the main stem, about 3 feet above the soil. By such selection it is possible to increase greatly the amount of dye, and recognition of this fact greatly accounts for the Honduras and Mexican logwoods controlling the markets. The seed pods should be stripped off when quite mature, and spread out in layers in a cool place. If they are placed in large heaps before they are properly dry they will heat and commence to ferment, thus destroying the vitality of the seed. A further selection operation is to pass the seeds through sieves to separate the full from the immature.

After the young plants have developed in the nurseries, the planting out is a very simple matter. It is not necessary that the lands to be planted in logwood should be lined and holed as is advised for other crops. The soil requires no preparation such as forking and draining, and no wind-belts or shade trees are needed. In dry and exposed localities the plants may be set out at 15 feet apart, and in humid or sheltered situations at 20 feet This will take 193 and 108 plants per acre, respectively. When planting, a small circle should be cleared, about 2 feet in diameter, of grass and bush. The soil should not be forked, but a small hole should be made with a spade just sufficiently deep and wide to accommodate the roots of the plant. Fill up with soil and press the earth with the feet as firmly as possible. The object of this treatment is to prevent the holes becoming filled with water.

Logwood is unlike other orchard crops, inasmuch as the whole of the tree must be cut down when mature, and not just its leaves or fruit. Owing to this, the question of obtaining a continuous supply arises. Where large areas are available, it may be practicable to divide them up into sections and to plant a certain area each year. This will guarantee a regular supply being obtained.

Logwood usually takes from eight to ten years to reach maturity. A saving of two to three years may be made on the second and following crops, by planting a fresh lot of seedlings throughout the plantations, midway between the existing trees after the sixth or seventh year.

The actual cost of planting out logwood does not amount, on an average, to more than 1*s.* or 2*s.* per acre. The Agricultural Department in St. Lucia is obtaining through the Imperial Department a supply of logwood seed from Honduras, of the variety which yields the greatest quantity of pigment. The Honduras logwood is known to yield a much higher percentage of dye extract than the Jamaican, and if seedlings of this can be raised for distribution, it will make the prospects of success in this attempt to revive an old industry more promising.

In conclusion it may interest the reader to know that two articles on logwood appear in Vols. IV and V of the *West Indian Bulletin*. The first refers to diseases of logwood, the chief one of which is a root rot; and the second article consists of chemical notes on the 'bastard' logwood. In this it is endeavoured to show the ways in which bastard logwood differs in chemical characteristics from the useful variety. An extension of this work in regard to the Honduras logwood to show why it is superior to the West Indian, would be useful, and would seem to be indicated.

MARKET REPORTS.

London.—The West India Committee Circular, January 27, 1916.

Arrowroot—2½*d.* to 4¼*d.*
Balata—Sheet 2*s.* 6½*d.* to 2*s.* 7*d.*; block 2*s.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations.; Grenada, 81*s.* to 84*s.* Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£37.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 67/6 to 85/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6½*d.* to 2*s.* 6*d.*
Nutmegs—6½*d.* to 9½*d.*
Pimento—1¾*d.* to 2¾*d.*
Rubber—Para, fine hard, 3/5½; fine soft, 3/5; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 10, 1916.

Cacao—Caracas, 15¼c. to 15½c.; Grenada, 15¼c. to 15⅝c.; Trinidad, 15c. to 15½c.; Jamaica, 14c. to 14½c.
Coco-nuts—Jamaica and Trinidad selects, $33·00 to $34·00; culls, $22·00 to $23·00.
Coffee—Jamaica, 9¼c. to 12c. per lb.
Ginger—14c. to 16c. per lb.
Goat Skins—Jamaica, 49c.; Antigua and Barbados, 47c. to 49c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape Fruit—Jamaica, $1·25 to $1·75.
Limes—$4·00 to $5·00.
Mace—35c. to 42c. per lb.
Nutmegs—15c. to 15¼c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—3⅞c. to 4c. per lb.
Sugar—Centrifugals, 96°, 4·83c. to 4·86c.; Muscovados, 89°, 4·18c. to 4·21c.; Molasses, 89°, 4·06c. to 4·09c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 8, 1916.

Cacao—Venezuelan, $14·75 to $15·00; Trinidad, $15·00 to $17·25.
Coco-nut Oil—90c. per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$6·50 per 100 lb.
Dhal—$6·75 to $7·00
Onions—$5·00 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 lb.
Rice—Yellow, $6·75 to $7·25; White, $7·00 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., February 9, 1916: T. S. Garraway & Co., February 9, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$16·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $100·00 per ton.
Molasses—No quotations.
Onions—$12·00 per 190 lb.
Peas, Split—$9·50 to $12·50 per 210 lb.; Canada, $3·00 per 120 lb.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $6·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·65 to $3·80.

British Guiana.—Messrs. Wieting & Richter, January 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per lb.	20c. per lb.
Cassava—	$1·20	——
Cassava Starch—	$10 to $11	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9c. per lb.
Dhal—	$7·00 to $7·25	$7·25
Green Dhal	——	——
Eddoes—	$1·92 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·25	$3·25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92	——
Rice—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
Tannias—	$3·12	——
Yams—White	$2·40	——
Buck	$3·12	——
Sugar—Dark crystals	$3·60 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Land Settlement After the War.

IT is clearly recognized that a large number of those men at present serving their country in a military capacity, who, before the war, were engaged in indoor occupations, will not be content to return to their former life after hostilities have ceased. They will have become accustomed to outdoor conditions, and in many cases altered temperamentally to such an extent as to make work behind the counter or at the desk distasteful. There will, too, be another side to the question, namely, that employers will find some men who have returned to their old work unfitted for it, even though they may not dislike it. And lastly there will be a large body of men whose health will have been impaired through exposure and injury; for many of these the confined life of the shop or factory will prove trying, if not positively harmful.

It follows, therefore, that after the war a big demand will arise for out-of-doors employment. This can only be met by a more extensive settlement of the land.

One of the first institutions to see the need of taking up this question immediately was the Royal Colonial Institute. They saw it not only as a national economic question for Great Britain, but also as an Imperial economic opportunity for the colonies. With the official support of His Majesty's Government, the Institute has been able fortunately to secure the services of the famous novelist, Sir Rider Haggard, who is also an authority on agriculture; and Sir Rider Haggard is at present touring South Africa, with a view to starting preparations for settlement after the war. Sir Rider Haggard will also visit Australia, where, as we pointed out in the *Agricultural News* some months ago, the Government of Queensland has already taken the initiative in regard to the provision of facilities for the land settlement of ex-soldiers.

We have on a similar mission in the West Indies at the present time, Major Boosé, of the Royal Colonial Institute. In these islands, of course, there are not the same possibilities for an extensive settlement as there are in the Dominions. Moreover, many men may not desire to settle in a tropical country, for several reasons. At the same time the West Indies can offer very attractive prospects and opportunities to those who do, and the comparative ease of plantation life, coupled

with the absence of rigorous climate, should appeal to those whose physical health has been impaired.

Several references have appeared in the London papers to Jamaica, which is recommended on account of its mountainous configuration, rendering it easy to obtain a change of climate by travelling but a short distance. Such an island would be ideal for invalids; while for those who are able to work there are still large areas of land awaiting cultivation in that colony.

But the new settler, especially in the tropics, needs definite attractions, and he must above all be granted land at low rates, and be provided with proper roads. In the West Indies, nowhere are these requirements better met, or will be better met by the time the war is over, than in St. Lucia. In the newly issued Pamphlet, 'Hints to Settlers in St. Lucia'* there appears the recent Ordinance that has been passed through the initiative of the Administrator, the Honourable Gideon Murray, which lays down the conditions under which the Government is prepared to sell Crown lands, of not less than 100 acres in extent, for the settlement of persons who have lately served in His Majesty's forces, or who come from outside the colony. Crown lands in blocks of not less than 100 acres will be sold at the rate of 15*s.* per acre, and 10*s.* an acre for each acre or part of an acre above a hundred. The purchase money has to be paid in five annual instalments, and half the cost of surveying has to be paid prior to occupation. The fee for the survey of 100 acres is about £20. So that it will be seen that in St. Lucia the necessary initial expenditure of capital is not prohibitive.

In connexion with this St. Lucia scheme the construction of roads is being carried on. Proper road communication, in the absence of water-ways, is essential. Then again the Agricultural Department is also co-operating in the matter of furnishing settlers with planting material as well as with valuable, skilled advice *gratis*.

These are the only places in connexion with which there appears to have been any definite work or published information specifically to this end, but doubtless, land suitable for the purposes indicated would be found in Dominica, Trinidad, Tobago, and other West Indian islands.

In a small way, therefore, St. Lucia—and, no doubt, other islands are considering a similar scheme after hearing Major Boosé speak—is following an imperial policy which, as we have shown, has a very wide and important significance.

The part to be played by Agricultural Departments in this new phase of land settlement is that of instructor, guide, and nurseryman combined. Much will depend upon close contact, especially at the beginning. In the West Indies our land settlement schemes, especially in Grenada and St. Vincent, have been unqualified successes, and although in the settlement of the soldier we shall have a more responsible type of settler, the experience obtained during the last fifteen years with the peasant cannot fail to be of value, and if the idea is taken up, as we may expect it will be, there is no reason why the settlement of ex-soldiers should not be as successful in the West Indies as in any other part of the Empire.

* 'Hints to Settlers in St. Lucia', Imperial Department of Agriculture for the West Indies, Pamphlet Series, No. 80.

SUGAR INDUSTRY.

REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS, QUEENSLAND, 1915.

This report includes an account of a large amount of experimental work relating to sugar production, and many of the results will be read with interest in the West Indies. Dealing with the progress of the industry, a useful table is furnished showing the yield of cane and sugar per acre, and tons of cane required to make 1 ton of sugar, during sixteen years. From 1899 to 1914 the number of tons of canes required to make 1 ton of sugar showed an almost continuous decline, thereby indicating a gradual increase in the efficiency of mill work. Actually, the figures run from about 9·8 in the earlier years down to 8·5 for 1914. This last mentioned figure is indicative of rich cane and superior milling. In fact the report states that the progress referred to is largely due to the improved varieties of sugar-cane grown by the farmers during recent years. As in the West Indies, many of these varieties have been distributed amongst the growers by the Department of Agriculture.

Coming to the subject of seedling canes in detail, it appears that from the average analytical results, Q. 813 seems to be the best cane from the standpoint of sugar content, followed by Q. 990 and Q. 137. Q. 813 also stands out well as a cropper. Its yield per acre of cane was, in 1913, 43·8 tons, and the yield of sugar per acre 7·9 tons. These figures show the very high standard attained with seedling canes in Queensland. The report goes on to state that B.3922 and B.3747 have proved satisfactory, and are worthy of trial in other sugar districts. The best of these new seedlings from a sugar producing and cropping point of view, which have not developed disease, have been reserved for distribution purposes, and it is notified that cane farmers may obtain material during the period of distribution, upon application, free of charge. A trial made with a Trinidad seedling cane from Louisiana did not show it to be sufficiently rich in sugar to be worth cultivating. The variety in question was T.211.

The report refers to some interesting ratooning experiments. Good results were got by leaving the trash in the fields, thereby conserving soil moisture. When the season is wet, however, cultivation pays, with the exception that the ploughing under of trash in the ratoons is distinctly unprofitable.

As in Hawaii, extensive experiments have been made in Queensland in regard to the value of poisonous sprays for the destruction of weeds. Where the growth of weeds is very rank it appears that spraying is not profitable.

Important trials with liming, subsoiling, mixed manuring, and ordinary cultivation are recorded in the report. It seems that subsoiling with lime gives a slight advantage over the plot limed without subsoiling, but not enough to pay for the cost of subsoiling. In the second series, lime with and without manure gave exactly the same result, so that the manures applied were so much waste money. In the third series, the subsoiled plot gave 1·65 tons of cane more per acre, which just about paid for the extra subsoiling operations. In the fourth series, manures without lime or subsoiling gave a slight increase of 1·86 tons over the plot without manures. The results, however, are so nearly equal, that it is evident, in a year like the present, little or no advantage has been gained from the use of lime fertilizers or subsoiling. At the same time it is pointed out in the report that it does not follow that these agents would not pay in normal seasons.

The report concludes with a section recording the work of the Division of Entomology. The principal pest which requires control is the cane grub. Attempts are being made in the direction of trapping by means of attractive odours, killing by the use of stomach poisons, the employment of deterrents, and the encouragement of natural parasites and predaceous insects.

The Growth of the Stem, Leaf, and Leaf-Sheath of Sugar-cane.—The writer describes a new method for measuring the growth of the hidden leaves and of the upper portion of the stem of the sugar-cane. By inserting a needle horizontally in the growing region, holes are made through all the leaves, sheaths, and internodes, which will serve as points from which to measure the growth of the various parts with respect to the outer sheath which has ceased growth.

By removing the leaves one by one after a certain time, the displacement of the holes in the different parts of the stem can be measured with respect to the small hole formed by the needle in the outer sheath. The writer discusses the 'pros' and 'cons' of this method, and its possible errors. He then describes the structure of the meristem and of the surrounding parts, as a method for indicating graphically the mode of growth.

From these determinations the writer concludes that the elongation of the sheath occurs later than the growth of the leaf; that the internode at the extremity of which the leaf occurs begins to elongate when the growth of the entire leaf has almost finished; that the growth is basipetal, and there is a zone at the base of the internode which has not yet reached its maximum growth when the upper portions have already reached theirs.

These observations were verified by measuring the cells of the sheaths and of the internodes at various stages of growth. In the cells furthest from the base of the internode the growth first reaches its maximum. The growth of the stem was studied by making a long narrow opening in the enveloping sheaths and marking the stem with ink. The same results were obtained by the various methods.

The writer explains how this mode of growth of the exterior leaves may be the primary cause of the symptoms of the disease known in Java as 'top rot' or 'pokkah-bong', and characterized by the rotting of the leaves, or by a defective unfolding of the leaves. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, September 1915.)

TRADE OF THE PHILIPPINE ISLANDS IN 1914-15.

The British Board of Trade publishes an interesting statement of the foreign trade of the Philippines during the years ended June 30, 1914 and 1915, respectively. The imports were during the latter year subject to general reductions throughout, the decline under iron and steel being most marked. The total value of the imports in 1913-14 was $56,011,570 and in 1914-15 it was $44,479,861.

Of greater interest to agriculturists is the statement of the exports.

That the decline in the value of exports which was only very slight, *viz.*, from $51,238,048 in 1913-14 to $50,915,061 in 1914-15, was largely due to the increased production of copra, and the enhanced price of sugar. The quantity of copra exported rose from 70,392 tons, valued at $8,297,429 in 1913-14, to 146,406 tons, valued at $12,394,712 in 1914-15; it will thus be seen that the increase in value was not commensurate with the large quantity marketed. It is remarked that the trade in copra followed the lines of previous years, with the exception of shipments to Germany, in place of which a new Italian trade of considerable importance was developed.

The following table shows the quantities and values of the principal exports from the Philippine Islands in the two years ended June 30, 1914 and 1915:—

Exports of	1913-14.		1914-15.	
	Quantity.	Value.	Quantity.	Value.
		Dols.		Dols.
Copra, tons	70,392	8,297,429	146,406	12,394,712
C'nut oil, lb.	18,691,412	1,996,648	29,218,739	2,726,514
Hemp, Manila, tons	130,774	22,375,106	123,446	19,469,642
Hemp, knotted lb.	1,020,606	852,733	371,916	224,067
Maguey tons	6,933	532,957	4,677	359,251
Sugar, tons	209,606	9,457,982	184,060	9,712,757
Cigars, No.	164,065,000	2,523,540	141,895,000	2,102,317
Leaf tobacco, lb.	31,605,503	2,018,294	24,951,354	1,528,579
Hats, No.	594,448	365,308	704,259	265,808
Other articles	—	2,818,051	—	2,131,414
Total	—	51,238,048	—	50,915,061

Dol. = 4*s*. 1⅓*d*. at par.

FRUIT AND FRUIT PRODUCTS.

THE BUDDING OF CACAO IN TRINIDAD.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for January 1916, includes, amongst its contents, 'Notes on the Budding of Cacao on an Estate Scale in Trinidad,' by Mr. W. G. Freeman, Assistant Director of Agriculture and Government Chemist, which is the title of a paper read before the Society on January 14 last.

Before dealing with the more recent work on budding, Mr. Freeman makes a few remarks on the grafting of cacao, in course of which fitting references are made to the earlier work of grafting carried on by the late Mr. J. H. Hart at St. Clair Experiment Station, Trinidad, dating back to 1898, and by Mr. Joseph Jones, Curator at the Botanic Station in Dominica, from 1906 onward.

Budding of cacao in Trinidad, it is stated, on an estate scale, practically dates from 1913. Two plants had been done earlier in Tobago, but the percentage of failures was so high that the method did not appear likely to be of any estate value. In November 1913 Mr. Freeman exhibited plants at the Board of Agriculture, and explained how Messrs. J. C. Augustus and J. de Verteuil had obtained sixteen budded plants from forty attempts. In July 1914 a practical demonstration was given at St. Clair Experiment Station, where the method of budding cacao in bamboo pots in the nursery was shown, and the history of budding briefly recapitulated. During 1915 budding has been steadily persevered with at St. Clair, 100 to 200 plants being done each month. The successes have ranged from 36 to 71 per cent. The lower yields are attributed mainly to the use of stocks which were rather too old. These plants have all been selected Forastero on Calabacillo stocks.

Budding has also been successfully carried on during 1915 at the Tobago Botanic Station, and two small plots established, one of eighteen plants and the other of six, the latter being budded Nicaraguan Criollo. From plants budded in St. Clair in 1914 and early in 1915, a ½-acre plot has been established at St. Augustine. These are said to have made good growth, a photograph exhibited showing a well developed specimen planted in July 1915, and now about 3½ feet high.

Mr. Freeman points out that although budding of cacao has been accomplished in a good many countries, yet there is little if any exact information available from them as to whether it is a desirable method for planters to adopt on an estate scale; but observes that it is an important part of the work of a Department of Agriculture to attempt to decide definitely questions of this character, and even if the results proved that the method was not desirable, it was important as it saved planters wasting money in useless directions. To this end an experiment had been laid out on a larger scale at River estate. The general plan and objects of this experiment are described in an article contributed by the same author to the *Bulletin of the Department of Agriculture* (Vol. XIII, pp. 320-22, December 1914), which is reproduced in the paper under consideration, to which readers are referred for further detail. It might be mentioned, however, that the work of establishing the various plots, and grafting and budding, has been accomplished, with the result that Trinidad will very shortly have 3½ acres altogether in budded cacao, and 1½ acres in grafted cacao, and it is hoped that these experiments will afford a definite solution of the question as to whether it is better or not for the planter to substitute budding or grafting for the ordinary method of establishing a cacao estate.

FERMENTATION OF CACAO, COFFEE, AND TOBACCO.

The investigations were carried out in the Botanical Garden of Victoria, Kamerun. It was observed that in the ordinary fermentation of cacao an alcoholic fermentation first takes place, followed on the second or third day by an acetic fermentation; the tannic substances of the cacao seeds are decomposed by atmospheric oxygen, which causes changes in the colour and taste.

When the cacao fruits are gathered, the seeds are removed, and allowed to ferment, stirring them for from two to ten days. The pulp covering them undergoes alcoholic fermentation, becoming soft, and developing a temperature of 40° to 50° C., which kills the seeds. At this point a little of the liquid formed during the fermentation enters the seeds, making them soft, and by means of the acid it contains rendering them more capable of resisting the action of bacteria and moulds during the succeeding drying period. While the latter progresses, and the water evaporates, the atmospheric oxygen penetrates into the seeds, and, with the help of enzymes, oxydises the astringent substances. Moderate heat promotes oxidation which, on the other hand, does not take place in seeds heated to from 80° to 90° C.

The amount of tannic substances contained in cacao seeds varied from 4·64 per cent. in a sample treated in the ordinary manner to 3·1 per cent. when the seeds were not allowed to cool during the night. It was still less, 2·44 per cent., when the seeds were not permitted to cool during the night, and were damped in the morning; and least of all, 1·4 per cent., when the seeds were put to ferment in a vessel containing oxygen. The market value of the seeds varies inversely with the amount of tannic substances they contain. In commercial samples the percentages of the latter were: Puerto Cabello 1; Arriba 1·98; Java 2·38; Maracaibo 2·62.

When the seeds contain over 20 per cent. of moisture butyric fermentation often occurs, and the seeds also become mouldy. Oxidation takes place more rapidly at temperatures from 50° to 60°C. than at about 50°C. At the latter temperature, however, the colour is more stable. If the oxidation is allowed to proceed too far the cacao loses its aroma. The best temperature for fermentation is from 35° to 40° C.

In two series of experiments cacao seeds were moistened till their water content amounted to 18 per cent., and then left to ferment for different periods of time and at different temperatures. In a Kamerun cacao, which before fermentation contained 3·64 per cent. of tannic substances, the amount of the latter sank to 3·58 per cent. after twenty-three hours' fermentation at 46° C., and to 2·78 per cent. after fifty-six hours' at 42° C. A St. Thomas cacao gave under similar conditions 2·78, 2·68, 2·56 per cent., respectively.

In order to prepare a more delicate product from strong cacaos (such as all those of West Africa) it is necessary to encourage oxidation, by slackening or interrupting the drying process when the moisture in the seeds is reduced to 20 per cent., maintaining at the same time the high temperature. When the drying is effected in the sun, this is done by placing the seeds in thick layers. In artificial drying, the seeds are collected in great heaps in the drums of the desiccators, the process being carried out in a warm atmosphere. The drying is only complete when the seeds have acquired the desired brown colour.

FERMENTATION OF COFFEE. The experiments were carried out at St. Thomas. The writer removed the greater

part of the pulp from the coffee beans, and subjected the latter to alcoholic- acetic fermentation that raised the temperature to 45° C. Then he exposed them to the action of atmospheric oxygen, and finally thoroughly dried them. While the seeds that had also undergone acetic fermentation assumed a yellowish white colour, and on roasting gave a beverage without aroma, those that had only undergone alcoholic fermentation remained a beautiful green, and made aromatic coffee. In the case of coffee, fermentation, besides killing the seeds, has the object of softening that portion of the pulp which still remains adhering to them after the greater part has been removed, and thus facilitating the washing and drying. Fermentation should, however, not be carried too far, for the acids have an injurious effect.

FERMENTATION OF TOBACCO.—This process is of the same type as the others described above, as is certainly proved by the alterations of colour it produces in the leaves. It has been demonstrated that during such fermentation there is a decrease in the amount of tannic substances; it is to be supposed that in the longer fermentation processes, used in the case of the finer tobaccos, the nitrogenous compounds are also attacked. The latter have a great influence on the quality of the tobacco, and by the prolonged action of the acids in tobacco fermentation an appreciable part of the nitrogenous compounds would be transformed into amido-derivatives, and the latter would be eventually converted into ammonia, nitric acid, and organic acids, by the agency of micro-organisms. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, May, 1915.)

FIVE ORIENTAL SPECIES OF BEANS.

In connexion with the interest being developed in the West Indies as to the cultivation of beans as a crop, a Bulletin of the United States Department of Agriculture, No. 119, contains interesting information supplied by C. V. Piper, Agrostologist in charge, and W. J. Morse, Scientific Assistant, with respect to new species of beans introduced from the East into the United States. The bulletin records information about five annual species of beans on which experiments have been conducted. These five are the adsuki (*Phaseolus angularis*), the rice bean (*P. calcaratus*), the mung bean (*P. aureus*), the urd bean (*P mungo*), and the moth bean (*P. aconitifolius*). Of these, the mung is cultivated more or less extensively in all parts of Asia where it will mature, and also in South-east Africa; the urd and the moth beans are cultivated only in India; the adsuki is almost confined to Japan and Korea; the rice bean is cultivated in China and India, and also in Japan and the Philippines

The writers say that as producers of seed for both human and animal food there are possibilities in these crops well worthy of further investigation. The adaptations of these beans are very similar to those of the cowpea, all requiring hot weather for their satisfactory development.

(1) The adsuki bean (*P. angularis*) is much cultivated for human food in Japan and Korea, and, to a small extent in China and Manchuria. The plants are summer annuals, bushy in habit, growing from 1 to 2½ feet high, according to variety and soil. As seed producers they are not only prolific but ripen evenly, and the pods do not split open readily. In Japan among the most common cakes are those made wholly or in part from aduski bean meal. This meal is eaten in soups and gruels of various kinds. It is also used for making various kinds of cakes and confections. The use of beans to make sweetmeats seems to be a purely Japanese invention, and the adsuki beans are also eaten popped like corn, and candied by boiling in sugar. They afford a food rich in protein, which might well become popular in other countries besides Japan. A valuable feature of this bean lies in its large yield of seed. Owing to their texture the beans are easily ground into meal or flour, and for such purposes are superior to any other bean. The flavour too is very delicate, lacking any objectionable taste.

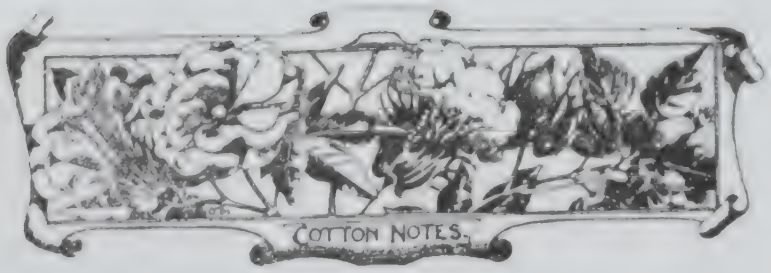
(2) The rice bean (*P. calcaratus*) is cultivated in Japan, China, India, Java, Mauritius, and the Philippines. The plant is an annual of somewhat twining habit, producing branches 3 to 6 feet long. It is very productive of seed, but the habit of the plant, and the easy shattering of the pods make it difficult to harvest.

(3) The mung bean (*P. aureus*) is cultivated throughout the southern half of Asia and in the adjacent Malayan archipelago, and through the eastern portion of Africa. In Bombay it is a crop of some importance, about 200,000 acres being grown each year. The seeds are used almost exclusively as human food, and the straw is fed to cattle. In Jamaica, it is stated, that both this species and the urd have been introduced by Hindoo labourers, and that the plant is there largely used as a green manure crop under the name 'Jerusalem pea.' The mung is of an erect habit, growing to a height of 1 to 4 feet, and some sorts twine slightly at the tips of the branches. As a field crop the mung is comparable to the cowpea and the soy bean, but as a seed producer it is far inferior to these.

(4) The urd bean (*P. mungo*) is very similar to the mung, but is easily distinguishable by the shorter, stouter, hairy pods, and larger oblong seeds. As a forage crop it is inferior to the mung. The pods, however, do not shatter so readily, and little of the seed is thus lost. It is stated that the urd is utilized as a green manure crop in Trinidad under the name of 'woolly pyrol', and that the Hindoo labourers cultivate this plant for food. As human food, however, the seeds seem far less desirable than other species, and as a forage crop it does not compare favourably, under American conditions, with the cowpea or the soy bean.

(5) The moth bean (*P. aconitifolius*) is cultivated as a crop only in India; there it is apparently of considerable importance. Recent authorities give an area of 300,000 acres of this species as grown in Bombay, and an area in the north-western Provinces and Oudhs of 211,000 acres. The bean is nearly always planted mixed with other crops. The plants produce numerous, slender, trailing branches from a short stem. A well grown plant makes a dense mass, 18 to 24 inches in diameter, and 12 to 15 inches high. In India the moth bean yields as much seed as the mung, the average yield per acre being said to be about 11 bushels, but under the conditions in Virginia and Texas, where experiments have been made with it, a very small yield of seed was obtained. Owing, however, to its numerous slender stems it produces a very fine quality of hay. It was observed, too, in the course of the Texas experiment that this bean showed a fine quality of resistance to drought, which quality is also noted by writers on Indian agriculture.

The Bulletin from which the foregoing information has been obtained contains capital illustrations of the five species of beans mentioned, from which it would seem that they all possess beans of elongated, round shape, in fact the picture of one or two of them remind a West Indian of the appearance of a very common wild West Indian Phaseolus, *P. semierectus*.



COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 8, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report there has been nothing doing, except for a sale of 18 bales of Superfine St. Vincent, at prices from 24*d*. to 38*d*.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 19, 1916, is as follows:—

ISLANDS. There was a demand for the limited offerings of odd bags, resulting in the above sales of small lots, chiefly tinged and off cotton.

There was also a demand for a crop lot, but below the view of the planter.

The unsold portion of the crop consists of only 200 to 250 bales classing Fine to Fully Fine, which are held at 30c. and upwards, and two crop lots held at full prices.

We quote, viz.:

Extra Fine	30c. = 19½*d*. to 20*d*.	c.i.f. & 5 per cent.
Fully Fine	29c. = 19*d*.	,, ,, ,, ,,
Fine	28c. = 18½*d*.	,, ,, ,, ,,
Fine off in class	27c. = 18*d*.	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. There continues an absence of demand: therefore the market is dull, yet the Factors are holding their offerings under instructions on a basis of Fancy 30c. In consequence of the high prices ruling for Egyptian cotton and the good reports of the fine trade, there is a hopeful feeling that the mills will sooner or later require further supply, admitting of the balance of the crop being sold on basis of quotations. However, should this not be realized, then we may succeed in buying in the near future at some concession.

We quote, viz.:

Fancy	30c. = 31c.,	landed.
Extra Choice	29c. = 30c.,	,,
Choice	28c. = 29c.,	,,
Extra Fine	27c. = 28c.,	,,

The exports from Savannah for the week were, to Liverpool 270 bales, Northern Mills 166 bales, and from Jacksonville to Northern Mills, 88 bales.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by Messrs. W. R. Dunlop, Scientific Assistant, H. A. Ballou, M.Sc., Entomologist, and W. Nowell, D. I. C., Mycologist, returned to Barbados by the C. R. M. S. 'Chignecto' on March 23, after having attended the Cotton Conference held in St. Kitts.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. A communication received from Mr. W. N. Sands, Agricultural Superintendent, reports that the picking of cotton in that Colony had been completed, and cotton stalks pulled up and burnt; plots of Lima beans (native), and Indian corn had been sown; plots of cassava reaped; cotton stainers collected; plots cleaned up; examination of cotton in the laboratory in progress; experiments started to ascertain whether cotton stainers cause injury leading to internal boll disease. The foregoing represents work in the Experiment Stations during the month of January. In addition to the pulling up and burning of plants in the cotton plot, the work in the Botanic Gardens was of a general routine nature.

The condition of the arrowroot and sugar crops was satisfactory; no improvement however is reported in the condition of the cotton crop. In regard to other industries there was little to report at this time.

Pests and diseases of crops, more particularly cacao, cotton, limes, and coco-nuts, were the subject of a special investigation by the Entomologist and Mycologist of the Imperial Department of Agriculture, Messrs. Ballou and Nowell, who, with the Agricultural Superintendent and the Assistant Agricultural Superintendent, visited estates in the Leeward and Windward Districts for the purpose.

The Agricultural Superintendent took control of the Government Ginnery for sixteen days from the 25th., while on the 31st the Assistant Superintendent left for the Grenadines on a special visit.

The weather during the month was showery, the rainfall recorded being—Botanic Station 7·44 inches, and Experiment Station 5·98 inches.

In a later communication Mr. W. N. Sands reports that in view of high freight rates the Arrowroot Growers Association have decided to raise the minimum price of arrowroot by ½*d*., making it 2¾*d*. per lb. Sugar manufacture was being kept back by the wet weather as the megass could not be dried.

The Imperial Commissioner of Agriculture passed St. Vincent on February 8, and had a meeting with several prominent cotton growers, discussing with them the object of the forthcoming Cotton Growing Conference at St. Kitts. An endeavour was made to arrange for two planters to attend the conference. Two more Credit Societies have been recommended for registration, making twelve in all, with a total membership of 400.

The Agricultural Superintendent has been appointed by His Honour the Administrator to represent the Agricultural Department at the Cotton Growing Competition to be held next month. The weather during February has been showery, the rainfall recorded being:—Botanic Station 6·89 inches, and Experiment Station 5·67 inches.

ST. LUCIA. Mr. A. J. Brooks, the Agricultural Superintendent, reports that the lime crop is nearly finished, while the sugar crop is being begun. During February, 1,000 lime plants have been distributed from the station. Preparations are being made for the extension of the lime factory building. The rainfall recorded during the month was:—Botanical Gardens 4·46 inches, Agricultural Station, Choiseul, 1·48 inches.

DOMINICA. Mr. Jones, the Curator, states that the early crop of cacao is ripening, but there are

indications that it will be a small one. The lime trees throughout the island are flowering heavily. There has been no change in market quotations of lime products, with the exception of green limes, the price at the end of the month for those being 16*s.* per barrel.

There have been several complaints of an abnormal presence of thrips on cacao trees. There has been a further extension of several acres in the new coco-nut experiment station. In the laboratory the work has included the analysis of samples of manures used at the Experiment Station during the past year, and also of samples sent in by planters.

Among plants distributed from the station, limes easily take the first place, a total of 8,550 having been sent out during the month; 33 cacao plants and 28 grafted cacao, together with 50 camphor trees have also been sent out. The rainfall at the Garden for the month was 1·90 inches.

MONTSERRAT. Reporting to this Office as to the affairs in the Botanic and Experiment Stations during the month of January, the Curator, Mr. W. Robson, mentions that the plot of Hawaiian papaws was in a very diseased condition, the stems suffering chiefly: another plot of the local type was more robust. The pine-apple plot continues to decline. The plot of Bush Lima beans, which has been flowering profusely, does not show any great development of pods; the same may be said of the climbing type. The latter, he adds, is no doubt an excellent green dressing.

Very little direct observation work was carried out in the field, owing to the indisposition, and subsequent absence on leave of the Curator. Three distillations of bay leaves were made, confirming the results obtained in the previous month, when a low percentage of oil was obtained. Attention was given to the lime experiment plot in Bellefield, and to the plot of bay trees at the Chateau. The rainfall recorded at Grove Station was 8·47 inches, and at Harris' 6·27 inches. At the former station rain fell on twenty-eight days, the total precipitation being much above the average.

It was contemplated that the onion house of the Onion Growers Association would be opened to receive onions on the 14th ultimo.

In a communication as to the affairs of the Botanic and Experiment Station during the month of February, the Curator, Mr. W. Robson, reports that a plot of cassava at the Grove Station, when reaped, yielded at the rate of 11 tons of roots per acre. The collection of sugar-cane varieties has been replanted.

Throughout the island the preparation of cotton land is being pushed forward, and it is hoped that most of the crop will be planted early, between March and April. The sugar crop is progressing. The new muscovado works at Rileys appear to be giving satisfaction. On that estate, fields are being planted with some of the newer seedling canes.

The Onion Growers Association commenced operation on February 14, but on account of the lateness of the crop only two small shipments were made. On several estates trials have been made in growing cowpeas as a catch crop on land prepared for cotton, with varying results. The Curator returned from leave of absence on the 12th instant, and has been busy with matters in connexion with the newly started Onion Association.

An interesting report has been received from Mr. E. Lomas Oliver, on three samples of cotton sent to him for report, one of which he strongly recommends for cultivation in place of Heaton 9. Unfortunately a report has not been received on the seventeen samples sent to the British Cotton Growing Association in October. At a meeting of the Board of Management of the Onion Growers Association it was decided in future to accept onions loose from the growers, as is done in Antigua.

ANTIGUA. Mr. Jackson reports that the weather experienced during February has ripened the canes; reaping is being pushed on in general throughout the island. During the month, 24,551 cane plants have been distributed from the Station; 118 Eucalyptus trees, and 104 coco-nuts have also been distributed, together with several packets of seeds and 843 lb. of yams for planting purposes. With regard to the onion industry, Mr. Jackson reports that a record order has been received of 354 lb. of onion seed for the coming season. The onion drying house has been opened, and 1,070 crates have been shipped; some severe attacks of thrips have been noticed, however, on some onion fields. During the month 1·95 inches of rain fell, making a total of 6·95 inches for the year.

ST. KITTS. With regard to the work in the Experiment Station, Mr. Shepherd, the Superintendent of Agriculture, gives details about the returns from some of the experiment plots of vegetables. Good returns have been received from one of the plots of Barbados white eddoes, and returns above the average from one of the plots of yams. Some of the varieties of sweet potatoes have given large returns. There has been distributed from the station 10 lb. of velvet beans, and 3,400 cane plants. Cotton seed for planting has also been sold to the amount of 468 lb. The reaping of the sugar cane crop is in full progress. The Basseterre sugar factory began work on February 1, and the results so far have been excellent. The tonnage of cane per acre has quite come up to the estimate, and in some cases exceeded it. On one estate in the Valley District a field of White Transparent canes has given over 50 tons per acre. The canes are fine and large, and free of disease. Moth borer however is present to a small extent. The young cane crop in some districts is well advanced. Attention is being paid to selection of plants from the best varieties. Grasshoppers are very prevalent in certain districts, and an attempt is being made to poison them with the Criddle mixture, but no definite results have been as yet obtained. On some estates in the northern districts land is being prepared for planting cotton.

The Superintendent has paid a visit to Nevis in connexion with onion and corn experiments. He has visited the Experiment Stations at Molineux and Brighton estates. The forthcoming Cotton Conference to be held in March is being looked forward to. The Agricultural and Commercial Society has selected delegates to the Conference, and arrangements have been made for receiving the visitors from the other islands. At a meeting on February 8, notes were read by the Agricultural Superintendent and the Chemical Assistant on the preservation of cane tops for fodder The rainfall for the month was 3·63 inches, making a total for the first two months of the year of 7·44 inches.

NEVIS. In Nevis the results of experiments with regard to peas, onions, and Indian corn are recorded by Mr. W. I. Howell, the Agricultural Instructor. Rounceval peas yielded a return of 200 lb. of dry peas from the $\frac{1}{2}$-acre plot. A plot of the same size, planted in onions, is expected to give a return of 4,000 lb. From the plot of Indian corn 1,398 lb. of corn on the cob was obtained. Distributions of cassava and sweet potato cuttings have been made from the Station, together with 129 lb. of Rounceval peas, 31 lb. of Indian corn seed, and 19 lb. of selected cotton seed.

The reaping of the cane crop throughout the island continues, and fair prices are being obtained in the local market, The moth borer however seems to be troublesome in some cases. During February 3·99 inches of rain have fallen, making a total for the year of 8·52 inches.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The possibility of attracting ex-soldiers as settlers to the West Indies after the war is discussed in the editorial in this number.

On page 100 there are two interesting articles on the budding of cacao in Trinidad, and on the fermentation of cacao and coffee.

On page 101 some account is given of oriental beans not commonly grown in other places.

Insect Notes refer to a butterfly which has been found very injurious to coco-nut palms in British Guiana. Under Plant Diseases will be found an interesting account of some new fungi, parasitic on insects in St. Vincent.

New Publications of the Imperial Department of Agriculture.

Three new pamphlets have recently been issued by this Department. Of these, 'Indoor Gardening for Schools,' by Dr. Watts, the Imperial Commissioner, has already been reviewed in the last number of this journal.

The two other pamphlets deal with matters connected with St. Lucia. One of them is a new and enlarged edition, brought up to date, of 'Hints to Settlers in St. Lucia', by Edward J. Cameron, Esq., C.M.G., formerly Administrator of that island. To this is appended a copy of recent additional crown land regulations passed by the Government, in which the conditions are set forth under which the Government is prepared to sell crown lands in St. Lucia, of not less than 100 acres in extent, for the settlement of persons who have lately served in His Majesty's forces, or who come from outside the Colony. The facilities granted to such settlers would seem to offer inducements to many desirable settlers in the near future, and to open up for St Lucia a prospect of great development.

The second of the pamphlets dealing with St. Lucia is on 'Agricultural and Economic Resources of St. Lucia', by Mr. A. J. Brooks, the Agricultural Superintendent there. Mr. Brooks' experience and knowledge of St. Lucia are a guarantee of the accuracy of the information conveyed in the pamphlet. It is worth noting that this pamphlet is being published by instalments in the *West India Committee Circular*.

Besides these three pamphlets, the Department is just about to issue two of the annual reports, viz. Report on the Botanic and Experiment Stations, Antigua, 1914-15, and Report on Sugar-cane Experiments in the Leeward Islands, 1914-15.

The new number of the *West Indian Bulletin* will also soon be published, the contents of which will be found noted on the cover of this journal.

Sugar Factory Development in India.

From the *International Sugar Journal*, February 1916, we notice that another step in the recent development of the sugar industry in India has been taken by the erection of a most modern white sugar factory in the Gorakhpur district. The factory has a capacity of about 400 tons of cane per twenty-four hours. There are two 30 inch × 60 inch mills with a crusher, and cane and megass carriers, room being left for an additional mill later. The boilers are four in number, of the multitubular type, fitted with wet megass furnaces. The triple effect has a heating surface of 4,300 square feet, and there are two vacuum pans each of 2,650 gallons strike capacity. There are seven crystallization tanks, and thirteen centrifugals arranged for three stage curing.

A modern sugar drier of the hot air type, and a sugar crushing plant have also been supplied. In the arrangement of the factory great importance has been attached to spaciousness around the machinery, and to the elimination, as much as possible, of hidden inaccessible spaces, which are opposed to good control,

Soil Erosion due to Heavy Rainfall.

This subject is one of interest to planters in the West Indies, especially in those islands the mountainous configuration of which causes a large annual rainfall. In a note in *The Colonial Journal*, January 1916, some useful suggestions with reference to this matter, as affecting Ceylon planters, are given. With regard to low lying land two inexpensive measures of dealing with the mischief are suggested—embankments and surface drainage. Surface drainage is carried out by means of trenches where there are small differences of level. Drainage increases the aeration of the soil, and, to a great extent, increases the value of the crops. Efficient drainage enables rather low lying lands to produce valuable crops. As regards land on hillsides, the method suggested is to terrace immediately all lands from which the original forest has been removed. A regulation enforcing this exists in Java. A striking example of soil erosion is afforded by some lands in Ceylon in the central hills. Over a large area the the forest was originally removed to make room for coffee, which later gave place to tea. No provision was made to retain the soil of the original forest, and, in consequence, the erosion of the soil has been enormous, and is still going on. Hence large sums are spent annually in adding manures to the land, because the soil-capital of the island has run to waste, and can never be replaced by any system of manuring.

Tropical Sanitation.

The address by Surgeon General W. C. Gorgas, delivered at the Fifteenth Annual Congress of Health Officers of New York State, notice of which is taken in the *West India Committee Circular*, February 10, 1916, contains very striking remarks on the subject of tropical sanitation by one of the greatest authorities on the subject.

He recalls the astounding losses of life caused by yellow fever in the West Indies in former days. The English Army, in 1794, lost 6,000 out of a total strength of 12,000 men in the West Indies. Again, in 1798, the French Army in San Domingo, out of a total strength of 25,000, lost over 22,000 from yellow fever.

During the nineteenth century the southern states of the American Union were frequently ravaged by epidemics of yellow fever. It was evident that these epidemics were imported from the focus which had existed at Havanna for the preceding 150 years. Later on scientific physicians demonstrated the fact that yellow fever was a mosquito-borne disease.

The fight against yellow fever in Havanna was undertaken vigorously. A quarantine was first established, and a system of inspection of all infected persons was carried out. Yellow fever patients were screened so that mosquitos could not bite them. All mosquito larvae, breeding anywhere within the city, were destroyed—a measure of the greatest importance. The result has been victory. Anti-mosquito work was commenced at Havanna in February 1901. The last case of yellow fever in the city occurred in September of the same year. Since that date this disease has practically disappeared from the northern hemisphere.

In 1898, Sir Ronald Ross, of the English Army, had demonstrated that malaria was conveyed from one human being to another by a species of mosquito known as the anopheles. By taking the same measures as had been successful against yellow fever, a similar result is being obtained with regard to malaria. Vigorous anti-mosquito work rapidly decreases the prevalence of malaria, and has caused it to become practically extinct in the once fever-haunted regions of Panama.

Agriculture and Education in Tonga.

The Tongan Islands which, roughly speaking, are the antipodes of the West Indies, are a group of islands having their native king, under the protection of the British Government. The Governor of Fiji is the High Commissioner, and there is a resident British Agent and Consul. It is interesting to remark that the officials administering the affairs of Tonga are in most cases well known as having been West Indian officials. In *Colonial Reports—Annual*, No. 870, there are some interesting details as to the agricultural prospects of the Tongan Protectorate, and a sto the education in those islands. Under the head of agriculture, we learn that the prosperity of Tonga rests at present almost entirely on the copra industry. The fruit trade, which amounted to £9,605 in 1910, dropped to £442 in 1914. This is due to two causes. Owing to the presence of the 'fruit fly', the citrus fruits of Tonga have been excluded from the Australian and New Zealand markets, and the interruption of the direct steamship service with New Zealand, owing to the war, has practically anihilated the trade in bananas. The Tongan Government are devoting attention to the cultivation of subsidiary products, besides yams, taro, and sweet potatoes for home consumption.

With regard to education, real progress seems to have been made in the Tongan Islands. Besides the fifty-seven public primary schools in 1914, with an attendance of 2,780 pupils, there is an important institution of secondary education in the Tonga College possessing a number on the books, at present, of 128 students. These are youths of an average age of sixteen years and eight months, and, according to the report of the chief assistant master, Mr. R. N. Burns, they make most satisfactory scholars. Naturally, English is taught, and it is now possible to converse in that language with 25 per cent. of the students. Considerable attention is devoted to agricultural teaching in the college. Systematic cultivation by the pupils of an area of 33 acres is carried out. Next year experimental work it is hoped, will be undertaken, while the theory of agriculture is taught in the class rooms.

INSECT NOTES.

A BUTTERFLY INJURIOUS TO COCO-NUT PALMS IN BRITISH GUIANA.

The latest number of the *Bulletin of Entomological Research* (Vol. VI, part 3, December 1915) contains an article entitled as above, by Lawrence D. Cleare, Jr., F.E.S., of the Biological Division, Department of Agriculture and Science, British Guiana. The following notes are taken from this article.

The insect which forms the subject of the paper is the Coco-nut Butterfly (*Brassolis sophorae*, L.). In 1914 it occurred in unusual numbers in the city of Georgetown.

HISTORY.

The first record of this insect in British Guiana is probably that by Schomburgh, in his 'Flora und Fauna von British Guiana', 1848, who gave no food plant for it. Within recen t years it has been reported in 1905 (*Official Gazette*, October 28, 1905) from Plantation Grove, near Clonbrook, 'where large areas of coco-nuts were considerably damaged'.

It was again reported in 1909, in the Mahaicony district, and from that time till 1914 it was of little importance, in fact it was seldom seem. The outbreaks of this insect, as recorded in the observed attacks on coco-nuts in British Guiana, would appear to recur after intervals of four to five years.

FOOD PLANTS.

The attacks of this pest are not confined to the coco-nut palm. The common cabbage palm, *Oreodoxa oleracea*, is also attacked, and while these palms do not appear to die so easily, they rarely recover satisfactorily, if badly stripped.

DISTRIBUTION.

Little is known of the distribution of *Brassolis sophorae* in British Guiana. As already mentioned, it is known to occur in three districts in the County of Demerara—Plantation Grove, the Mahaicony district, and Georgetown: it is reported from Onderneeming on the Essequibo coast, and is stated to have been observed in Berbice. It is probable that this insect occurs along the entire coast-lands.

Outside the colony, it was recorded in Dutch Guiana as early as 1705, and in more recent years, from 1904 on, it has been recorded as occurring in Trinidad.

LIFE HISTORY AND HABITS.

The eggs are laid in masses of from 100 to 150 on the stem and underside of the leaves of coco-nuts and other palms. They are smooth and shiny, pinkish in colour, and cylindrical in shape, and measure about 1 m.m. in diameter.

The larvae in most cases hatch from all the eggs of an egg mass simultaneously. Newly hatched larvae measure about 4 m.m. in length and about 3 m.m. in thickness. The head is large, and out of proportion to the size of the body.

In colour the head is black to dark reddish brown, the body a light claret-red, with six light-yellow longitudinal stripes extending its entire length. When full grown the larvae measure about 50 m.m. in length. The body is dark brown in colour, the longitudinal lines being of a dirty yellow. The entire body is covered with soft, short, light coloured hairs.

The habits of the larvae are peculiar. They feed almost exclusively at night, resting during the day in long cylindrical pockets or nests open at both ends, which are formed by binding together with silken threads a number of leaflets of the palm. Throughout their larval life they move together in procession, or rest in masses all heading in the same direction. In these nests several hundred larvae collect, with their heads all pointing in the same direction: a single nest may weigh as much as 2 lb. The duration of the larval period is not well known, but it is believed to be about four weeks.

The pupae are of two sizes, the female which are larger than the male, averaging about 25 m.m. in length. The pupal period lasts about two weeks.

As in the case of the pupa, the female butterfly is larger than the male. The female measures about 3 inches in expanse of wings, the male from 2·5 to 2·75 inches.

The general colour of the wings is brown above, light beneath. The forewings above are crossed by a band of yellow or orange yellow. The hind wings of the male are brown above, suffused with red which is tinted with orange. The hind wings of the female are of a deeper brown with reddish patches near the margin.

SPREAD OF THE PEST.

A remarkable feature of this (1915) attack by Brassolis was the direction of its spread. Starting at some point to the south-west of the city it spread to the north-east, in a direction directly opposite to that of the prevailing winds. Although practically the whole city suffered, there were blocks in the midst of the affected area that remained untouched. It was observed that palms near the sea were but very slightly, if at all, attacked.

AMOUNT OF DAMAGE DONE.

The caterpillars devour all the green part of the leaves, leaving only the thick midrib and the leaf veins. They pass from leaf to leaf until the entire tree becomes denuded or skeletonized. Trees which are completely defoliated in this way often die as the result.

NATURAL ENEMIES.

This pest has many natural enemies. The adult insects are captured and eaten by many birds, particularly the common Kiskadee (*Pitangus sulphuratus*); and the eggs and pupae are parasitized. At least two species of parasites have been reared from the eggs of this insect, and *Chalcis annulata* has been obtained from the pupa.

METHODS OF CONTROL.

The habit of the larvae of congregating in nests during the day offers the best means of destroying the pest. The nests can easily be seen from the ground, and a boy can be sent up to cut the leaves bearing them, and the larvae can be destroyed by crushing, burning, etc. Care should be exercised to destroy all the caterpillars, including those which are shaken or fall from the leaf when it is thrown down.

H.A.B.

It having been shown that a wide range of variation exists in the alkaloidal content of belladonna plants, the work described in *Bulletin, No. 306*, issued from the Bureau of Plant Industry, United States Department of Agriculture, was undertaken to determine whether the characteristic of alkaloidal production is transmissible to the progeny through seed, and whether the character is changed by vegetative propagation. The results thus far show that the first generation plants from seed of cross-polinated selected individuals displayed a characteristic of the maternal parent with regard to alkaloid productivity. Plants were grown from cuttings, and at two stages of their growth these plants showed a marked tendency to display the same characteristic regarding alkaloid production as the plants from which they were propagated and the original parents of those plants. These results are interesting, and it would be useful to know whether the same thing applies to the tobacco plant in regard to its nicotine content.

LIME BURNING IN SMALL PITS.

The following extract from an article in *The Agricultural Gazette of New South Wales*, November, 1915, will probably be interesting and useful to planters in the West Indies, on whose estates similar conditions may exist to those referred to in the opening sentence of the extract, and who may find it profitable to burn small quantities of lime for their own use.

In districts where there is limestone in the subsoil, or limestone outcrops, and a fair supply of good timber fuel, it will usually pay the irrigation farmer to burn his own lime for concrete channels, either in co-operation with other farmers, or on his own account. In some districts it would pay settlers to erect a properly constructed lime-kiln on co-operative lines to burn lime for concrete channels, buildings, and for use as a fertilizer. Where a kiln is not available, the stone may be burnt in a square or rectangular pit, sunk, preferably in a clay soil, with a passage of access to the bottom. A pit 12 feet by 8 feet, by 8 feet deep, will be large enough to burn about 14 yards of lime at one time, which should be enough for the needs of the average 50-acre farm. In limestone rubble country the stone may be raised, and screened twice, first through a coarse screen by means of which the large stones suitable for lime burning are separated from the small stones suitable for gravel, and from the dirt, after which the gravel and dirt may be separated by means of a smaller screen.

To burn the limestone, a layer of dry sticks and brush, about 6 inches thick, should first of all be spread in the bottom of the pit, and on top of that a layer of box logs (preferably green and dry mixed) 10 feet long and from 1 foot to 2 feet in diameter; on this layer of fuel a layer of limestone may be laid, followed by further alternate layers of fuel and limestone until the pit is filled, each layer of limestone being from half to two-thirds of the thickness of the layer of the fuel beneath it. When the pit is filled, a fire may be started at the bottom of it through the passage of access, which may be left open or closed according as more or less draught is required. If there is any risk of rain, a covering of some sort should be rigged over the pit. Lime burnt in this way will take about four days to burn; it will take a larger amount of fuel in proportion to the quantity of stone burnt than would be necessary in a properly constructed kiln, but this matters little where fuel of the right quality is plentiful.

THE PROSPECTS IN MARTINIQUE.

Given favourable weather conditions, a fine sugar crop is expected this year in Martinique. All the fields which, owing to former low prices of sugar, had been converted into pasturage are now replanted in canes. Owing to the war, and more to the difficulty of transporting vegetables, ground provisions, &c. to Fort de France just now, since the cessation of the steam coastal service, living is extremely costly. All the available sound creole horses are being requisitioned for the use of the French Army at big prices. The automobile invasion in Martinique during the last eighteen months having caused a regular slump so far as horses are concerned, breeders are now experiencing a god-send in this direction The colony has sent on no less than 3,000 men to fight, and from all reports they are giving the best account of themselves. Among the latest of the successful minor industries recently started is a pine-apple farm and nursery—the jam manufactured being of excellent quality, which on export to France, meets with ready sale. (*Dominica Chronicle*, February 2.)

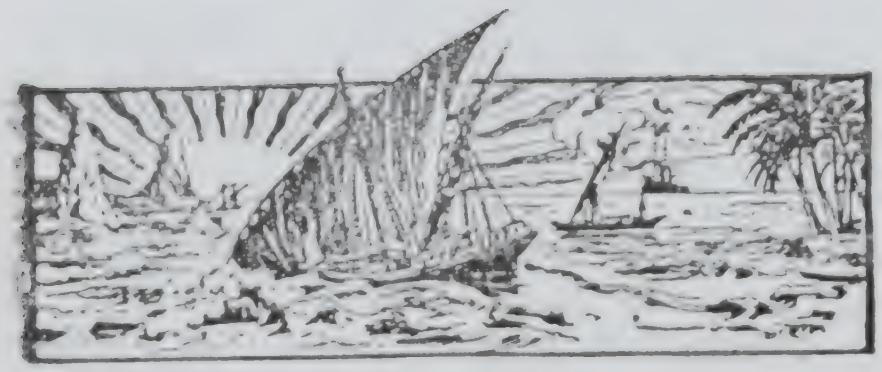
SUCCESSFUL LONG-DISTANCE SHIPMENT OF CITRUS POLLEN.

According to the *Experiment Station Record* for January 1916 shipments of citrus pollen were made from Florida to Japan for use in making hybrids in the variety collection of citrus fruits at the Imperial Horticultural Experiment Station at Okitsu, Shidzuoka Ken. The viability of this pollen in 30 per cent. cane sugar solution was tested by Y. Kumagai of the above station. Different methods were used in preparing the pollen for shipment.

The results of the test show conclusively that pollen can be successfully shipped from Florida to Japan, and be in a viable condition on arrival four to six weeks after it is gathered. The most promising method for shipping the pollen over long distances appears to be that of drying the anthers in vacuum over sulphuric acid. The vacuum glass tubes were filled with 1 to 2 inches of anthers, covered with $\frac{1}{2}$-inch of cotton, exhausted to about 0·5 mm. pressure in the presence of sulphuric acid, and the tube was then sealed. As far as practicable the pollen was kept at a temperature of 10° C. until sealed.

Assimilation of Atmospheric Nitrogen.—Professor Bottomley stated some years ago that he had discovered nitrogen-fixing bacteria in the cortical cells of the stem of tomatoes. According to a notice in *The Gardeners' Chronicle* for December 4, 1915: 'the most recent research on the subject, that of Dr. E. Mameli and Professor G. Polacci, shows that not only the Leguminosae, but many other flowering plants are able to make use of atmospheric nitrogen. Among flowering plants for which they claim this power are Cucurbita, Pepo, Acer Negundo, Polygonum fagopyrum, and they also ascribe it to such "Water-Ferns" as Azolla caroliniana and Salvinia natans. Frank long ago maintained the view that the power of assimilation of free nitrogen belongs to all green plants, and this view receives support from these recent researches.'

The Report of the Tenth International Veterinary Congress which was held in London from August 3 to 8, 1914, is that of the last meeting held by this body. At the First General Meeting on August 4, Sir John M'Fadyean, the President, moved that, in view of the war conditions which had just begun, the Congress should merely transact the formal business necessary to bring the meeting to a close. This was agreed to, and the Congress adjourned *sine die*. This International Congress of veterinary experts has accomplished good work since its first meeting in 1863 with regard to the objects for which it is convened. Owing to the efforts of the members of the Congress progress has been made not only in the collection of reliable statistical information with respect to infectious diseases among animals, but also with regard to effectual checks on such diseases. It is interesting to note that Lieut. P. T. Saunders, M.R.C.V.S., attended this Congress as the representative of the Imperial Department of Agriculture for the West Indies.



GLEANINGS.

It is stated by Mr. Lyne in the *Tropical Agriculturist*, Ceylon, for October 1915, that the recently established school of agriculture at Peradeniya is intended in the first place for the training of teachers in the vernacular schools, with a view eventually of making agriculture a compulsory subject in the Ceylon code of education.

It is generally believed that the presence of iron is necessary for the formation of the green colouring matter of plants. According to the *Journal of the Chemical Society*, No. 638, December 1915, it has been found that a pyrrole salt can take the place of iron. The experiments were conducted with maize grown in water cultures.

Attempts to cultivate limes and lemons in Fiji have not, according to the Annual Report on the Department of Agriculture for the year 1914, met with as much success as was anticipated. Some of the limes planted in 1906 are yielding fruit below the average in size. A new plot of selected plants, including a few rows of the thornless lime from Dominica, have been planted.

In the *Wealth of India* for December 1915 appears an article on the oil pressing industry in the United Provinces. It attempts to show that the establishment of oil crushing factories in the United Provinces forms one of the most attractive commercial propositions existing to-day in the whole of India. Oil is obtained principally from castor, cotton, linseed, rape, and mustard seed.

According to the *Journal of Heredity*, the percentage of endemic plants in Central America is 70, in India, 60, and in Ceylon, less than 30. It is as high as 80 in the Hawaiian Islands, while Western Australia even surpasses this figure, where it is 85. By endemic is meant plants which are native, that is to say, plants which have not been introduced so far as human records can show.

An obituary notice concerning the late Professor Ernest Ule, a leading authority on Brazilian rubber trees, appears in the *India Rubber World* for February 1, 1916. Professor Ule in his expedition up the Amazon discovered three new species of the Manihot variety, and he also wrote a book on *M. dichotoma*, *M. heptaphylla*, and *M. pianhyensis*. Professor Ule also did some botanical exploration work in British Guiana.

Horse beans (*Canavalia ensiformis*) have done very well at Morne Rouge and Westerhall in Grenada, both in separate plots, and as cover crops between limes and coco-nuts. A good supply of seed has been harvested, and considerable quantities have been distributed to various parts of the island for trial. As a cover crop and a soil renovator the plant is eminently suitable, and worthy of extensive use, particularly as it is readily and cheaply established.

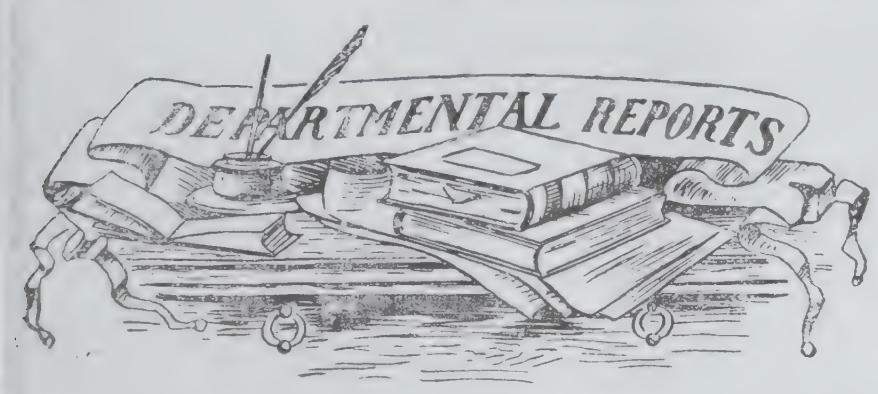
A good example of the big profits that may be expected in pedigree pig raising is afforded by information recently received from Mr. S. F. Edge, of Sussex, England. Pigs from one large black sow during 1915 sold for £101 1*s*. 6*d*. and left the owner five gilts of high quality for his herd, worth altogether at least £50. Few animals on the farm give such a good return for such a small capital expenditure as pigs, and if an open air system of management is adopted there is generally little trouble in regard to disease.

A forthcoming meeting of the Royal Society of Arts will be of interest, for at it Sir Daniel Morris, K.C.M.G., will read a paper on the timber resources of Newfoundland. Sir Daniel Morris also presided at the meeting on January 26 last, when Mr. J. Arthur Hutton, Chairman of the British Cotton Growing Association, read a paper on the effect of the war on cotton growing in the British Empire. On the 16th, of this month Professor W. R. Dunstan, C.M.G., F.R.S., is reading a paper on the subject of the work of the Imperial Institute for India.

The growing interest in Roselle, known in the West Indies under the name of sorrel (*Hibiscus sabdariffa*), as a crop of the Tropics, is referred to in the *Philippine Agricultural Review* for October to December 1914. In Hawaii the crop has been planted on quite a large experimental scale, and one jam manufacturer found it possible to pay 40c. per lb. for the dried product. There is apparently a good demand in the United States for roselle product, and it is believed that there is room for the establishment of small preserving factories in the Philippines.

The transpiration ratio of the sugar-cane plant (that is to say, the number of pounds of water which requires to be transpired in order to form 1 lb. of dry matter) is lower in the case of the cane than in that of almost any other cultivated crop. The figure representing this value would appear to range between 150 and 200. That is to say, in the production of a crop of canes of 30 tons per acre, 1,800 to 2,500 tons of water per acre require to be absorbed through the roots of the plant, and transpired to the atmosphere through the leaves. This amount of water is actually equivalent to from 18 to 25 inches of rain.

There has been of late years a marked improvement in the goats in Barbados owing to the importation of thoroughbred stock of the Toggenburg and other superior strains. Other West Indian islands may now take advantage of the neighbourhood of Barbados, and import thence some of the fine milk-producing goats. Mr. Thos. E. Manning informs this office that he has at present for sale several half and three-quarter bred Toggenburg young goats, both ewes and rams, and that he will give willingly any further information as to price and shipment of them to any other island, on application to him, care of Manning & Co. Ltd., Bridgetown, Barbados.



ANTIGUA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

This publication which has just been issued comprises one of the longest reports that has emanated from the Antigua Department, and it contains a very large amount of useful information which should be noted throughout the West Indies.

In the Botanic Gardens, it is stated, certain improvements have been effected with a view to making the general appearance of the gardens more attractive. Useful notes are given in the report concerning agaves as hedge plants for fibre production. These notes appear in the section dealing with the work in the Gardens.

Work in the Nurseries has consisted principally in the raising of a large number of coco-nuts, limes, bay, Eucalyptus, and onion seedlings, which have been distributed to planters. Cane cuttings and provision crop materials were also sent out in considerable quantity.

The notes on plant importation refer principaily to Eucalypts, a group of trees which has received special economic consideration in Antigua.

The longest section of the report is given to an account of the plot experiments at the Botanic and Experiment Stations. This work is closely connected with the industries of the Colony subsidiary to the cultivation of cane. Variety trials have been continued with sweet potatoes, cassava, eddoes, tannias, and yams. Large differences are shown in the yielding capacities of Colombian and Jamaican varieties of cassava, while apparently definite immunity to disease is exhibited by two varieties of yams.

Further experimental work of this description has had regard to the tillage and manurial requirements of maize or Indian corn. Figures are given which show that it is remunerative to introduce weekly tillage with a view to preserving a soil mulch. The planting experiments show that 1 foot by 1 foot is the best distance to set the seed of the plant. The manurial experiment at the stations has indicated the value of adding pen manure. The estate trial with artificial fertilizers failed, but will be repeated. A system of selection of local corn has been introduced, and may be expected to lead eventually to a much needed increase in the average yield per acre in Antigua.

The cotton hybridization work has been continued during the year under review. The St. Eustatius × Sea Island cross continues to breed true, and may be found suitable for cultivation on the heavier lands. The cotton grafting experiment has given negative results.

With onions, the test of establishing the crop by transplantation *versus* planting *in situ* was repeated, with results not in agreement with those obtained the previous year. Various useful trials have been made with English potatoes, and with beans and peas.

Special investigation by the agricultural officers in this report has reference to the selection of cotton for various characters.

A considerable amount of information is included in the report with regard to plant pests and diseases. The usual pests and diseases of sugar-cane were noticed, but not to any alarming extent. As regards cotton, the presence of the 'boll worm' may be drawn attention to. Some damage occurred to the foliage of lime trees by the adult beetle, *Exophthalmus esuriens*, and to the roots by its larva. Grubs of the brown hard-back have been troublesome to Indian corn.

As regards progress in the chief industries, the report shows that the shipment of sugar was some 5,300 tons more than in the previous year. The area under cotton showed a marked decrease, on account of the war and the increased demand for sugar. Figures are given showing the exports of cotton for the last eleven years.

With regard to onions, a special review of the proceedings of the Antigua Onion Growers Association is given, and the great success which has attended its activities is clearly demonstrated. The substance of this report has already been published in the *Agricultural News*.

In a special note on Barbuda it is shown that considerable progress has been made in the Dependency with regard to cotton cultivation, and the improvement of live stock.

Special lines of work have consisted in irrigation, and experiments with explosives for breaking up sugar-cane land. The system of supplementary irrigation to the weekly rainfall, and the effect of dynamite upon soil bearing ratoon canes are of much interest.

Additional subjects of interest are the spraying of cattle for ticks, and the enlargement of Bendal's equipment.

Reference has already been made in a previous paragraph to the corn industry. Dr. Tempany contributes to the present publication a useful review of the developments with respect to the Government Granary. The whole scheme, like that for onion production, will be followed with interest, not only in the Leeward Islands, but in other colonies as well. Its significance lies in the fact that Antigua is gradually being changed from a merely consuming centre into a producing one—a change of great economic importance. A plan of the Granary is an interesting feature of the report.

A minor effort that is deserving of encouragement is the growing of vegetables (other than onions) for the Canadian market. This idea has met with a certain measure of success already.

The educational work, in its bearing upon agriculture, has been continued in Antigua with, as usual, satisfactory results. The Department continues to maintain interest amongst overseers and others in the Reading Courses Examinations of the Imperial Department, and the proceedings at the meetings of the Agricultural and Commercial Society, to which reference is made, have included the reading and discussion of papers on live and varied subjects.

It is satisfactory to learn that the success of the candidate who won the Leeward Islands Scholarship was largely due to his efficient knowledge of agricultural science. But the report states that science work in the Grammar School, of which the candidate was a member, is seriously handicapped through there being no grant for laboratory equipment.

In conclusion, it will be evident from the foregoing review of this report that a great deal of useful work has been satisfactorily accomplished in Antigua during 1914-15. Much of its value lies in the close co-operation existing between the Government and the planting community. The officers concerned are to be commended for the activity manifested, and for the keen interest they have taken in their duties.

PLANT DISEASES.

SOME NEW ENTOMOGENOUS FUNGI IN ST. VINCENT.

ON A WOOD-BORING GRUB.

Early in 1915, Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, forwarded for examination specimens collected by him in the Botanic Gardens, Kingstown, of a fungus growing on the larvae of the beetle *Cryptorhynchus corticalis*, Boh., boring the wood of *Codiaeum variegatum*, the common 'croton'.

The affected larvae are found in their tunnels in the stems, retaining their form and colour, but converted into hard sclerotia. From them the stalk of the fruit body of the fungus penetrates to the surface of the bark, and there expands into a peltate disc of a reddish brown colour, upon the centre of which is borne a conical spine. These discs, when developed singly, measure, in the specimens to hand, up to some 3 m.m. in diameter, but commonly several run together, in which case a more or less circular body is formed, which may approach to a diameter of a centimetre, and bears several of the above mentioned spines. Asci, of the form usual in the genus Cordyceps, are produced at the base of closely set, flask-shaped cavities opening on the upper surface of the disc. Specimens of the fungus have been forwarded to Kew for examination, and Miss E. M. Wakefield reports that it appears to be a new species of Cordyceps, and will be described as such.

ON A SOIL GRUB.

On January 1, 1916, the writer found, in the soil near the roots of a cacao tree at Mount William estate, a grub having the larval characters of the species of Diaprepes and Exophthalmus common as root feeding weevils in these islands. The grub was dead, but unshrunken and hard, and its form was perfectly preserved. The specimen was brought to Barbados, and kept in the laboratory in a corked tube, and after some weeks was observed to have devoloped a number of erect brown threads, the fruit bodies of a fungus of the genus Isaria.

The fungus continues to develop, and at the time of writing (March 2) about a dozen threads of various lengths and thicknesses have appeared, the two longest and strongest of which, arising from the anal end, are over 10 c.m. in length and about 0·5 m.m. in thickness. The growing tip is white for some distance, and behind it, as it progresses, are developed lateral bristles 1-2 m.m. long, each clothed with hairs bearing terminal conidia.

ON THE CACAO THRIPS.

Messrs. Sands and Harland, Agricultural Superintendent and Assistant Superintendent, respectively, have had under observation for some months a fungus found by them on *Heliothrips rubrocincta*, Giard. infesting cacao leaves. It has the appearance of being parasitic on this insect, being found on larvae as well as adults, under circumstances which suggest no other cause of death. It occurs as a whitish mould on the body of the insect, attaching it lightly to the leaf. The writer has as yet had the opportunity of examining only a very small amount of material. In this there seemed to be no differentiation of conidiospores, the conidia occurring in spherical groups scattered along the tangled hyphae. During a recent visit to the somewhat remote districts where it occurs, very little of the fungus was found, but the writer is informed that it has been seen to be so abundant as to justify its being regarded as a considerable factor in reducing the numbers of the insect.

ON SCALE INSECTS.

During a visit paid to Queensbury estate in January of this year the writer observed patches of a slaty grey fungus of the Corticium type extending over considerable areas on the stems of pigeon pea, where they were heavily infested with *Aulacaspis pentagona*, Targ. The fungus closely resembles *Septobasidium pedicellatum*, Schwein., common in St. Lucia on colonies of the purple scale on citrus trees, and will very possibly prove to be that species. Its occurrence in St. Vincent is, so far as the writer is aware, not previously recorded.

The same remark applies to the fungus *Ophionectria coccicola*, E. and E., which was found on the same occassion in great abundance in one particular situation, growing on scale insects infesting lime trees. The circumstances of its occurrence under very sheltered conditions suggest that its non-development in other districts, which has been the subject of some regret, is due rather to insufficient humidity than to actual absence of the species.

Another fungus found on the purple scale at Queensbury appears to be quite new to these islands, so far as the records of the Imperial Department go. It is a light clear pink Aschersonia, forming groups of small, closely-set, rather woolly, sessile stromata, mostly spherical or nearly so, but in a few cases exposing a small open disc with a smooth surface and of darker colour.

It may be added that the red fungus, *Sphaerostilbe coccophila*, Tul., and the black fungus, *Myriangium Duriaei*, Mont., were also present in abundance with those above-mentioned.

W.N.

THE CONNEXION BETWEEN CROP PRODUCTION AND BACTERIAL ACTIVITY.

In his paper in the *Journal of Agricultural Research*, Vol. 5, No. 18, on the relation between certain bacterial activities in soils, and the crop producing power of these soils, Mr. P. E. Browne, of the United States Department of Agriculture, appears to have established that the connexion between the two, that is to say between bacterial activities and crop yields, is so close as to make the examination of a soil for bacterial change of great practical importance. It would appear that the tests of a soil in the laboratory for ammonification, nitrification, and similar changes may indicate accurately the crop producing power of the soil, or, at least, the relative crop producing power of several soils.

In one experiment with Indian corn it is shown that the yields obtained are in close agreement with ammonification. Thus in a plot which gave a yield of 50·25 bushels per acre the ammonification was 55·33 m.gs., while in the plot which gave 74 bushels of corn per acre the ammonification was 72·79 m.gs.

In conclusion it may be stated that these experiments have shown that ammonification and crop production are very closely related, and that the determinations of the ammonifying power of soils made during the growing season may show their relative crop producing powers.

DYNAMITE EXPERIMENTS.

In connexion with our editorial on this subject in the last issue of the *Agricultural News*, the following notes on experiments in the Federated Malay States, taken from the *Experiment Station Record* for January 1916, will be read with interest. It will be remembered that we arrived at the conclusion that the use of dynamite is not generally remunerative in the West Indies.

Experiments were conducted at the Castleton Estate, Telok Anson, to test the effect of explosives on the growth of rubber. As measured by the girth increment for one year, the control plot gave an average increase in girth, 21·93 per cent. and the dynamite plot an increase of 32·14 per cent. for every 100 inches of the original girth.

Summing up the results of various experiments with dynamite, conducted by the Department of Agriculture in the Federated Malay States, it appears to be unequalled for breaking up hardpan. It is most effective on heavy clay, and hard laterite soils, and least effective on light or loose soils which offer no resistance to the explosion. It is believed that it might be profitable in making holes previous to planting, especially in heavy soils, half a charge of dynamite being sufficient for this purpose. It may be successfully used in breaking up logs and tree stumps previously weakened by termites. The value of dynamite for cultivation is not doubted, but the high cost of the explosive prevents its more general use.

The Value of Burr Grass.—In the *Proceedings of the Agricultural Society of Trinidad and Tobago* for December 1915, reference is made to a note which appeared in the report of the Agricultural Department, St. Lucia, 1914-15, in regard to the value of Burr grass. This stated that the grass in question is valuable in pastures in its young stage, and that it will withstand the severest drought and the hardest grazing, and thrives in the poorest soil. It is pointed out, however, by the Trinidad journal, that the bristles of the burrs are liable to inflict very disagreeable injury on animals and men. Cattle frequently get their muzzles pricked by the burrs, and at times burrs enter the mouth, and lacerate the tongue, gums, and inner sides of the lips, producing festering wounds. It would seem that if burr grass is to be encouraged on pastures, it should only be done when it is possible to keep it sufficiently well grazed or cut to prevent flowering. The statement made in the Trinidad journal by Dr. Fredholm in which he condemns this grass, 'lock, stock and barrel', is an exaggeration, since the grass has a distinct nutritive value, and power of resisting drought. Only mechanically is it objectionable; and this only at the later stages of growth.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of January:—

Though the drug and spice markets practically started again on January 6, after the usual Christmas holidays, they cannot be said to have assumed anything approaching the ordinary business conditions until a week later, namely on the 13th, and even then with a very restricted amount of business, coupled with an almost general advance in prices, which applies to citric acid, ginger, nutmegs and kola, while lime juice, lime oil and sarsaparilla were lower. The following are the details.

GINGER.

At the spice auction on the 12th of the month no Jamaica was offered, but washed Cochin was quoted at 35*s.* and Calicut at 32*s.* 6*d.* to 34*s.* On the 19th it was stated that good common Jamaica was fetching from 67*s.* 6*d.* to 70*s.*, and medium to good, 75*s.* to 80*s.* At auction on the 26th, Jamaica was in good supply, 97 bags of small, dull, washed sold at from, 75*s.* 6*d.* to 76*s.* For good, medium cut Calicut, 74*s.* to 74*s.* 6d. was paid, and 26*s.* 6*d.* for small, limed tips.

NUTMEGS AND ARROWROOT.

At the spice auction on the 12th of the month, 317 packages of West Indian nutmegs were offered and sold, 62's fetching 1*s.* 8*d.*, 69's. 1*s.* 1*d.* to 1*s.* 3*d.*, and 96's to 98's $6\frac{1}{2}d.$ to 7*d.* Some Eastern were also brought forward and sold. At the same auction some 1,500 barrels of St. Vincent arrowroot were offered, and sales were effected at from $2\frac{1}{2}d.$ to $3\frac{3}{16}d.$ per ℔.

SARSAPARILLA.

At auction on the 13th of the month, sarsaparilla was well represented. Of grey Jamaica, 42 packages were offered and 16 sold, of native Jamaica 68 packages were offered and 33 sold, of Lima Jamaica, 27 packages were offered and 6 sold, while of Mexican and Honduras 18 and 8 packages, respectively, were brought forward, but found no buyers. For the grey Jamaica 1*s.* 7*d.* to 1*s.* 8*d.* per ℔. was paid for partly rough and coarse to fair fibrous, and 1*s.* 5*d.* to 1*s.* 6*d.* per ℔. for middling partly, mouldy grey. For the native Jamaica 8*d.* to 9*d.* per ℔. was realized for dull and inferior red and yellow mixed. Fair red fetched 10*d.* to $10\frac{1}{2}d.$ and low yellow, 7*d.* For the 6 bales of Lima Jamaica 1*s.* 7*d.* per ℔. was paid, and 9*d.* per ℔. was asked for the unsold Mexican.

CITRIC ACID, LIME JUICE, LIME OIL, KOLA, TAMARINDS, AND CASHEW NUTS.

Throughout the month citric acid has held a strong position, owing, it is said, chiefly to the scarcity of the raw material, and the difficulties attending the shipment. At the beginning of the month prices varied from 2*s.* 8*d.* to 2*s.* 10*d.* per ℔. at which price it stood at the close of the month, when it was said there was a very large demand for export to Russia. Of lime juice there has been good supplies in the markets during the month at prices varying from 2*s.* 7*d.* to 2*s.* 10*d.* per gallon, and quite at the close of the month fair West Indian was to be obtained at 2*s.* 6*d.* per gallon. Of lime oil there have also been good supplies; West Indian distilled being quoted at 6*s.* 6*d.* and hand pressed at 7*s.* 6*d.* At the auction on the 13th. kola nuts were in good supply; 45 packages of West Indian were offered and all sold at 6*d.* to $6\frac{1}{2}d.$ per ℔., with the exception of two lots of inferior quality which were disposed of at 5*d.* to $5\frac{1}{2}d.$ per ℔. At the beginning of the month tamarinds were reported to be somewhat scarce, the value of Barbados in bond being quoted at 18*s.* 6*d.* per cwt., but at the close of the month it was reported that fair West Indian in bond were obtainable at 16*s.* per cwt. As many as 130 packages of cashew nuts were offered at auction on the 13th. of the month, but found no buyers.

MARKET REPORTS.

London.—The West India Committee Circular, February 10, 1916.

Arrowroot—2½*d.* to 4¾*d.*
Balata—Sheet 2*s.* 8*d.* ; block 2*s.* 2½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 90*s.* ; Grenada, 80*s.* to 84*s.* 6*d.* Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£35 to £36.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—6*s.* to 7*s.*
Ginger—Jamaica, 70/- to 85/-.
Isinglass—No quotations.
Honey—30*s.* to 38*s.* 6*d.*
Lime Juice—Raw, 2/9 to 3*s.*; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—8*s.* to 8*s.* 10*d.*
Mace—6½*d.* to 2*s.* 6*d.*
Nutmegs—6½*d.* to 9¼*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 3/2; fine soft, 3/1; Castilloa, 1/11.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 3, 1916.

Cacao—Caracas, 15¼c. to 15½c.; Grenada, 15¼c. to 15⅝c.; Trinidad, 15½c.; Jamaica, 14c. to 14½c.
Coco-nuts—Jamaica and Trinidad selects, $33·00 to $34·00; culls, $22·00 to $23·00.
Coffee—Jamaica, 9¼c. to 12c. per lb.
Ginger—14c. to 16c. per lb.
Goat Skins—Jamaica, 49c.; Antigua and Barbados, 47c. to 49c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape Fruit—Jamaica, $1·25 to $1·75.
Limes—$4·00 to $5·00.
Mace—35c. to 42c. per lb.
Nutmegs—15c. to 15¼c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—3⅞c. to 4c. per lb.
Sugar—Centrifugals, 96°, 4·83c. to 4·86c.; Muscovados, 89°, 4·18c. to 4·21c.; Molasses, 89°, 4·06c. to 4·09c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 3, 1916.

Cacao—Venezuelan, $16·50 to $17·50; Trinidad, $19·20 to $19·68.
Coco-nut Oil—91c. per Imperial gallon.
Coffee—Venezuelan, 11c. to 12c.
Copra—$7·00 per 100 lb.
Dhal—$7·00 to $7·50
Onions—$6·00 to $6·50 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $7·00 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 8, 1916; T. S. Garraway & Co., March 8, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$16·00 to $17·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $90·00 to $100·00 per ton.
Molasses—No quotations.
Onions—$4·50 to $12·00 per 190 lb.
Peas, Split—$9·50 to $10·00 per 210 lb.; Canada, $3·00 per 120 lb.
Potatoes—Nova Scotia, $4·00 to $4·75 per 160 lb.
Rice—Ballam, $6·75 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·75 to $4·00.

British Guiana.—Messrs. Wieting & Richter, January 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per lb.	20c. per lb.
Cassava—	$1·20	——
Cassava Starch—	$10 to $11	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9c. per lb.
Dhal—	$7·00 to $7·25	$7·25
Green Dhal	——	——
Eddoes—	$1·92 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·25	$3·25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92	——
Rice—Ballam	$5·50 to $5·75	——
Creole	——	$5·50
Tannias—	$3·12	——
Yams—White	$2·40	——
Buck	$3·12	——
Sugar—Dark crystals	$3·60 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XV. No. 364. BARBADOS, APRIL 8, 1916. PRICE 1*d*.

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The Planning of Field Experiments.

THE bulk of the experimental work conducted at Botanic Stations in the West Indies and elsewhere consists in plot trials in connexion with plant selection, the testing of new strains, the manurial requirements of plants, and the like. Until recent years this work was regarded as being comparatively simple and straightforward, and such as anyone familiar with plant culture might arrange and carry out. It is now generally recognized that such is not the case, at least as regards the planning and arrangement of such work. To be moderately certain that useful and reliable results shall accrue from agricultural experiments, a considerable amount of preliminary theoretical consideration is necessary; one needs to be clear as to what it is one wishes to demonstrate, and what degree of precision in methods is necessary to solve the problem or problems proposed. In other words, scientific methods are just as necessary with field experiments as with laboratory experiments. The chief difference between the two is that, in laboratory experiments the conditions of the experiments can be regulated, that is, the number of factors can be strictly limited and controlled; in field experiments there are a large number of interacting factors which are not under control, and our results are largely subservient to the law of chances. The only way in which we can hope to approximate to the truth, is by manifold repetition, by the careful recordance of fluctuating factors of environment like rainfall and humidity, and by correlating these with the results of experiments.

Ideas as to the manner in which manurial experiments should be conducted have of recent years undergone considerable modification. In the first place, extensive duplication is now considered necessary. Generally speaking, one control or untreated plot and a series of untreated plots are not enough. They ought to be duplicated several times according to circumstances. This is particularly important as regards the control plot, for it is essential to be able to compare the variation between two controls, as well as that between a control and a treated plot. Manurial experiments with crops like sugarcane and provisions, in which the material produced is simply vegetative growth, are of a more simple character than manurial experiments with fruit-producing crops like cacao and limes. With these crops,

which are permanent, we are frequently faced with the manifestation of distinct individuality. If plots are selected at random and judged merely by general appearances, serious error may be introduced. The control plot, for instance, may contain a larger number of trees which are naturally heavier yielders than the treated plot—a circumstance that would tend to vitiate the effects of manurial treatment. Where manurial trials are conducted to determine the effect of fertilizers on fruit yield, the natural yields of the trees should be recorded first. The effect of manures on developing trees before they come into bearing, is another matter and concerns vegetative growth. It has to be remembered, too, that in manuring orchard crops the effect of manures on the soil as well as on the plant is introduced. With annual crops where thorough cultivation is practiced periodically together with rotation of crops, this effect is not felt to the full extent.

From year to year a large number of plot trials have been made in the West Indies with different varieties of provision crops. It would appear that in some instances, as with some of the experiments with varieties of sweet potato, the results obtained are not conclusive. It has been the custom to conduct each year, in single plots of very small area, a trial of each variety. The mean of several years' results with each variety is regarded as representiug the relative productive power of that variety. It would seem that a quicker and more reliable insight into their relative productive powers could be obtained if, instead of spreading the experiment over a number of years, all the trials were conducted in one year, each plot being duplicated many times. The mean of ten years' results has not the same scientific significance as the mean of ten results obtained in one year. In referring to these experiments, however, it is only fair to point out that, apart from their object of showing the relative values of different varieties, they are the source of an annual supply of planting material for distribution amongst peasant growers: and so the work has another object, the recording of yields being partly incidental.

The selection of seed is another line of experimental activity which calls for preliminary thought and consideration. This has been recognized in connexion with cotton, as is shown by the success obtained by means of individual plant rather than mass selection. Attention is only just being given to the selection of the coco-nut. Here again we must go to the individual plant, though not in quite the same sense as in the case of cotton selection. Nuts should be selected from the most productive trees growing under the same conditions as the less productive ones. The kind of nut to be selected will depend upon what section of the market for coco-nut products one intends to supply. If copra is to be the principal product, then large nuts with a high endosperm content will be selected. Where large numbers of the nuts themselves are shipped, the aim of the grower will be to produce uniform nuts just above the standard size.

All field experiments are influenced to a very large extent by climatic conditions principally relating to moisture. It is therefore important that all field experiments should be accompanied by systematic weather observations. Hitherto the rain-gauge has been considered the only essential equipment. As a matter of fact the bare recording of the precipitation of rain is almost valueless. It is necessary to know, as well, at what times the rain fell, so that the effective rainfall can be calculated. Of even greater importance are humidity observations, since humidity is closely correlated with growth. Wind, being inimical to growth, should also be recorded by an anemometer. In cases where it is intended to carry on plot experiments from one year to another, these climatic observations are especially important as affording about the only means of arriving at the cause or part cause of variation in annual results.



LEEWARD ISLANDS: REPORT ON EXPERIMENTS WITH SUGAR-CANE CONDUCTED IN ANTIGUA AND ST. KITTS, 1914-15.

This report is divided, as usual, into two parts, one concerning varieties of sugar-cane, the other manurial experiments with sugar-cane. It may be thought, and with some justification, that the publication of this report which deals with the year ending March 31, 1915, is somewhat belated; it should be borne in mind, however, that a summary of the results is placed before the Local Agricultural Societies in the two islands immediately the results have been got out. Thus this report is intended to serve purposes of record, and to enable workers in other parts of the world to follow what is happening in the Leeward Islands.

PART I—EXPERIMENTS WITH VARIETIES.

The experiments with varieties of canes are dealt with first under the heading 'Plant Canes in Antigua'. The mean return from all stations for the year under review shows

B.6308 occuping the leading position, having given in Antigua an average return of 3,560 lb. of sucrose per acre, and 22·0 tons of cane. The second place was taken by B.6450 with an average yield of 3,100 lb. of sucrose and 19·3 tons of cane per acre. This variety, which has won for itself a great reputation in Barbados, seems to have accommodated itself equally well to Antigua. Canes which appear to show very considerable degrees of promise are B.3922 and B.6388. After occupying a leading position for many years, B.4596 in the year under review dropped to a lower position. It is still, however, to be considered a very reliable variety. None of the Antigua seedlings have taken a high position in the table of averages. A.2, which has evinced considerable merit in St. Kitts, has filled the twentieth position in the table of averages for Antigua. D.625 which usually occupies a leading place in the plant cane averages, has this year fallen to the 33rd place, and B.208, in spite of its high sucrose content, to 37th.

A table is given on page 21, furnishing means for each variety growing during the past fourteen years.

The information concerning ratoon canes in Antigua shows that the lead is taken by B.6308 which, by the consistent way in which it has come to the front indicates itself to be a variety showing considerable promise. Sealy Seedling is second in the table, bearing out the reputation which it already possesses as a cane on which a good deal of reliance can be placed.

In the St. Kitts experiments with varieties of cane, we see under the heading of Plant Canes that the leading position in the table is taken by D.116 with an average return of 5,680lb. of sucrose per acre and 30·3 tons of cane per acre. B.376 is second and D.1111 is fourth.

The cane-growing areas of St. Kitts may be roughly divided into two main divisions: that of the leeward coast and the Basseterre valley district, and that of the northern area. The heavier rainfall and the generally more seasonable conditions experienced in the northern area have combined to give somewhat higher yields than elsewhere. Of the above canes D.116 has done relatively better in the northern district, as has also D.1111. D.109 and A.2 have taken equally good places in the returns in both areas; B.376, on the other hand, has done relatively much better in the Basseterre area than in the northern district.

The experiments with ratoon canes in St. Kitts show that D.116 again occupies the leading position, while B.1753 comes second, D.109 third, and Sealy Seedling sixth. A.2 occupies the lowest position as a ratoon.

As regards the experiments in Nevis, the lead is taken by Sealy Seedling; A.2 comes second and B.1528 third.

PART II—MANURIAL EXPERIMENTS.

In 1913 a new series of manurial experiments was started with plant canes to determine the best way and to what extent artificial manures can be used as a substitute for pen manure, it having been shown that under the conditions of the Leeward Islands, a field of plant canes which has been provided with 20 tons of pen manure is in receipt of all that it requires from a manurial standpoint. Unfortunately in the Leeward Islands, it is by no means always possible to get 20 tons of pen manure per acre. The results obtained in these experiments so far cover only two crop seasons, and therefore are not conclusively representative of what is to be expected under average conditions. As a matter of fact these experiments during both seasons were conducted more or less under conditions of drought.

Taking the mean of two years' results, the best returns were obtained in experiment numbers 5, 11 and 20. That is, No. 5 in which 40 lb. of nitrogen as sulphate of ammonia (in two applications), 40 lb. of phosphoric acid as vi-phosphate, and 60 lb. of potash as sulphate of potash were added; No. 11 and No. 20 received the same quantities of phosphoric acid and potash, but a larger quantity of nitrogen (60 lb. per acre).

The application of nitrogen without phosphoric acid and potash showed pecuniary losses. Phosphoric acid without nitrogen and potash gave a decreased yield. Potash applied alone showed a profit, as also did potash and phosphoric acid applied together.

The complete manuring, as in experiment No. 5, gave a return somewhat higher than that obtained from the application of 20 tons of pen manure. With canes at 15*s.* 10*d.* per ton, experiment No. 5 shows a gain of 34*s.* 9*d.*—the highest return obtained. At the lower valuation of 10*s.* 10*d.* per ton of canes, the profit shown by this experiment is negligible.

In general it would seem that the profitable use of artificial manures for plant canes in the absence of pen manure depends upon (a) the rainfall, and (b) the price of canes.

In relation to the more recently introduced experiments with nitrogenous manures, nitrolim and nitrate of lime, it has been shown that nitrolim is ineffective as a manure when applied to ratoon canes, but nitrate of lime possesses a value nearly equal to that of sulphate of ammonia. The application of molasses to ratoon canes has proved to be unproductive of benefit: the effect of similar application to plant canes is under investigation.

The report under notice gives at the end the area under cultivation in different cane varieties in Antigua and St. Kitts. In Antigua by far the largest area is under White Transparent; in St. Kitts White Transparent also occupies a very high position in regard to its area, as a matter of fact coming second to B.147 which is first, being grown on 3,625 acres. It is interesting to observe that in spite of all the new varieties brought to the notice of planters and recommended for entensive trial, the old White Transparent still holds, to a larger extent than any others, the confidence of the planters.

It would not be fitting to conclude this review without calling the reader's attention to a valuable table of analyses of pen manures and allied organic manures such as are obtainable in moderate quantities for sugar-cane lands in Antigua and St. Kitts. These tables refer to such material as sheep pen manure, rotted megass and compost, pods of the Saman tree, clippings of Gliricidia, crushed cotton seed, cacao husks, pigeon pea stems and leaves, coco-nut husks, French weed, sweet potato vine. These are examples to show the sort of substantives which the Superintendent of Agriculture considers might be more generally utilized to take the place of pen manure in the Leeward Islands.

The Department of Agriculture of New South Wales has issued a useful farmer's Bulletin (No. 88) on fruit preserving, including canning, bottling, jam making and candying peel. The publication is well illustrated, and detailed instructions are given in connexion with the operations described. It is possible that the production of candied peel might be increased in the West Indies, and the attention of citrus growers is directed to this matter.

FRUIT AND FRUIT PRODUCTS.

IMPROVEMENT OF TROPICAL FRUIT IN THE PHILIPPINES.

The work done by the Bureau of Agriculture in the Philippine Islands is of the highest utility and interest in every department of tropical agriculture. A very striking feature of the work done by this department is the attention that is being paid to the scientific development of the quality of all sorts of tropical fruits by selection and grafting.

In the *Philippine Agricultural Review* for the second quarter, 1915, there is an account of the working of the Lamao Experiment Station, in which the section dealing with the results obtained in budding and grafting various tropical fruit trees is not only interesting but highly instructive to planters of orchards in the tropics.

The writer of the account referred to, Mr. P. J. Wester, Horticulturist in charge of the Station, states that there are cultivated there no less than ninety-three species of the less known tropical fruits, of which he gives a list, for the purposes of experiment. This does not include citrus fruits, mangoes, avocados, pine-apples, papaws, or grapes, all of which are also the subjects of scientific research in the Station.

Some striking results have been obtained by budding the delicious cherimoya (*Anona cherimolia*) on stocks of the monkey apple, *A. palustris* (glabra). The hybrid produced by crossing the cherimoya with the sugar-apple (*A. squamosa*) to which the name 'atemoya' has been given, has proved a success. This hybrid has again been crossed with the custard apple (*A. muricata*), and with the soursop (*A. muricata*), and the fruiting of the resultant seedlings is awaited with interest. The seedlings of this last cross are reported to be exceptionally vigorous.

With a view of making the propagation of superior individual trees possible, great attention is paid to budding and grafting, the method found most desirable in dealing with tropical fruit trees being what is known as shield budding. In this way there have been established sweet varieties of those intensely sour fruits the carambola and the bilimbi (*Averrhoa carambola* and *A. bilimbi*), which have been introduced into the West Indies in their sour form, and are used to make pickles.

In the course of these budding experiments some considerations of great practical value to tropical horticulturists seem to have been established. Mr. Wester remarks that in order to obtain a successful result in budding of some species, it is found necessary to remove the leaves from the bud-wood while still on the parent tree, sufficiently in advance of the performance of the budding to permit of the formation of a well-healed leaf scar; in other species one of the essential points is that the bud-wood and the stock be approximately of the same age and appearance; some species may require the observance of both these rules. In far the largest number of species, however, the plants seem indifferent whether these conditions are observed or not. To the first class, which require the use of well matured bud-wood, from which the petioles of the leaves have been removed, belong the mango, cacao and cashew. The bud-wood of all the Annonaceæ should be mature enough to have completely lost any green colour in the bark. The second condition, of having the bud-wood and the stock of approximately the same age and colour should also be observed with the mango, cacao, cashew and golden apple, *Spondias dulcis* (cytherea). In some of these, as for instance the mango, the bud-wood, though mature, still remains green. With most of the other tropical fruits, guava, tamarind, carambola, citrus fruits, etc., bud-wood may be successfully used with the petioles of the leaves left adhering to it.

In another article in the same number of the *Philippine Agricultural Review*, Mr. Wester makes some observations on new and noteworthy tropical fruits in the Philippines. Some of these are already known in the West Indies; some seem hardly worth while introducing in their present stage of evolution, though it seems probable that the Philippine horticulturists may develop them into desirable acquisitions in the future. One of them, however, does seem to be well worth introducing into the West Indies as soon as may be; that is *Artocarpus odoratissima*, known in the Philippines as 'marang'. This is a medium sized tree, with large green entire or nilobate leaves, presenting a very similar appearance to its relative the bread-fruit. It bears a large oblong fruit averaging more than 6 inches in length and more than 4 inches in diameter, studded on the outside with soft greenish-yellow spines. The rind is thick and fleshy: the interior contains a white, sweet, juicy, aromatic pulp separated into segments, about the size of grapes, attached to a core, each segment enclosing a seed easily separated from the pulp.

By passing a knife round and through the rind of the ripe fruit, with a little care the two halves of the rind can be removed, leaving the inner segments adhering to the core like a bunch of white grapes.

In flavour the marang is somewhat like the sugar-apple, but richer and more aromatic. Mr. Wester believes that when better known, it will be highly prized as a dessert fruit.

EXPERIMENT IN SHIPPING DURIAN SEEDS.

It is often thought that seeds which are to be sent long distances should be thoroughly dried, and packed as dry as possible to insure a good germination. The following experiment made with seeds of the famous Malayan fruit the durian (*Durio zibethinus*), shows that this is not always the case.

On May 4, 1915, Dr. P. J. S. Cramer, Chief of the Plant Breeding Station, Buitenzorg, Java, sent by parcels post three boxes, each of which contained four durian seeds. These seeds are moderately large, about $\frac{3}{4}$-to 1 inch long and $\frac{1}{2}$-inch or more in diameter. The boxes were all the same size, namely $4 \times 3 \times 2$ inches. The seeds were loosely packed with charcoal mixed with coco-nut fibre refuse. Box No. 1 was packed dry; 25 c.c. of water was added to box No. 2, and 50 c.c. of water to box No. 3. The seeds reached Trinidad on July 6, having been two months on the way.

When the boxes were opened it was found that all the seeds in box No. 1 had dried up completely and were mere shells which could be crushed between the fingers. In box No. 2 there were two good seeds which had already begun to germinate, while the other two were rotted. In box No. 3 all the seeds were good and had germinated *en route*, but one had grown so much that the shoot was badly broken. The seeds were handled carefully and planted in pots in a mixture of coco-nut fibre refuse and sand. One plant got broken off accidentally, but the other four have grown well, three now being 14 inches high and one 20 inches high.

As the durian seed has the reputation of being a difficult shipper, four plants from twelve seeds after a journey of two months would seem to be very good. With many similar seeds it is probably principally a question of giving the right degree of moisture to the packing material. (J. B. B. in the *Bulletin of the Department of Agriculture* of Trinidad and Tobago, Vol. XV, No. 1.)

PAPAIN FROM MONTSERRAT.

The amount of papain exported in 1914 was 2,443 lb. valued at £1,269. Prices continue to remain steady, and a very considerable stimulus has been given to the planting of papaw trees, as the result of a recent visit of Mr. J. H. Cummings, of a firm of manufacturing chemists of Toronto, Canada, which firm is anxious to handle larger quantities of the article.

Several estate owners have become interested, and the extent of the area now being planted in papaws ought appreciably to affect the exports in the course of a year or two. Exports of papain touched £2,000 in value in the year 1903, but had dropped again to £483 in value in 1908.

Until recently there do not appear to have been any regular plantations of papaws, the bulk of the drug coming from isolated trees or clumps of trees cultivated by the peasants. (Report on the Experiment Station, 1914-15.)

COCO-NUTS IN DOMINICA.

The table below showing the exports during the past five years, is evidence of a gradual increase of interest in this product:—

1910	391,044
1911	402,622
1912	539 791
1913	448,747
1914	554,549

Visitors from the East who possess first-hand knowledge of coco-nut plantations are much impressed by the appearance and vigour of the palms in Dominica, and they consider the island is well suited for this cultivation.

There are considerable areas of land on the Windward Coast, where the palm thrives even better than on the Leeward Coast, which could be utilized for coco-nuts, were capital forthcoming for the undertaking. (Report on the Agricultural Department, 1914-15.)

Feeding Experiments on Horses with Sugar and Meat-meal.—These experiments were carried out to determine the value of a mixture of meat-meal and sugar as a substitute for oats in feeding horses. The mixture used consisted of sugar denatured with beet pulp, and meal containing 51 per cent. of digestible protein and 2·85 per cent. of crude fat. One kilo of oats in the diet was replaced by 1 kg. of sugar and 150 gms. of meat-meal.

Three lots of five horses were fed on the following rations:—

Group I, hay and oats: Groups II and III, hay, sugar and meat-meal The sugar and meat-meal were given gradually in small quantities, and only after a certain time were the oats entirely replaced by these substitutes. Once the animals became accustomed to the new diet they accepted it readily. Their coats remained glossy and fine, digestion was normal, and their working capacity was not impaired. The weights of twelve of the horses increased during the period of the experiment.

It is concluded that:—

(1) A daily ration composed of 14·2 lb. of sugar and up to 2 lb. of meat-meal may be fed without danger for a certain period.

(2) Horses generally become readily accustomed to this ration.

(3) The ration should be increased by concentrated foods when the horses are put to heavy work. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, September 1915.)

MOTOR PLOUGH DEMONSTRATIONS IN ENGLAND AND FRANCE.

Principally on account of the present difficulties in getting sufficient labour for the tillage of fields as a result of the War, certain trials with power-driven implements have been conducted in England and France.

According to the *Journal of the Board of Agriculture* for November 1915, three County Councils combined to hold a demonstration near Cambridge and at other places, and it appears likely that under war conditions, certain forms of motor ploughs may find systematic employment. The motor plough which appears to have given the greatest satisfaction is known as Martin's Motor Plough. The feature of this machine is that it obtains its motion from an endless chain or creeper 6 inches wide, giving a 3-feet continuous tread. There is a creeper on each side, and the one in the furrow has a tendency to break up the soil rather than solidify it. The creeper divides work well on dry, light lands, and when the plough is replaced by a cultivator, the engines draw this readily through the freshly ploughed ground without any injury to the soil. At Appleby (Lincolnshire), although some time was occupied in examination and enquiries, it ploughed 1½ acres in four hours (double furrow). This is rapid work, when one considers that a team of good horses can scarcely do more than an acre a day on medium to light land.

This machine is worked by one man; the consumption of petrol per acre varies from about 1½ gallons to 2½ gallons. It can turn readily on a 4-yard to 5-yard headland, and appears to be better adapted than tractors for small fields, hilly land, and land on the ridge system.

A more powerful machine exhibited was Crawley's Motor Plough. This was also self-contained, and worked very powerfully. It is capable of ploughing the heaviest classes of soil satisfactorily.

The cost of the above motor ploughs, which it will be understood contain both the motor and the plough in one, is £200 each.

The advantage of a tractor is of course that it can be used for work other than ploughing, but it has to be remembered that farm work with tractors needs at least two men.

As regards the French trials, referred to in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, September 1915, these were not official but were the result of the importation from the United States of machines by a French landowner. All were tractors. Three of these were bull tractors, two were endless self-laid tractors of the caterpillar type, and one a large four-wheel type. They were all, save the latter, constructed for medium and small farms. The performance of the bull tractors is stated in the reference to have been excellent; their simplicity, flexibility and easy management were a source of surprise to the spectators. Their cost is £120. The caterpillar type used in this demonstration cost £240. The bull tractors have two large wheels, one of which is a driving wheel and one small steering wheel, and a two-cylinder horizontal motor. In ploughing, about 5 horse power is available for haulage.

COTTON CONFERENCE.

FIRST DAY'S PROCEEDINGS.*

In his presidential address, Dr. Watts dealt first with the nature and purpose of the Conference. It was pointed out that agricultural officers and leading representative growers of cotton being assembled together, there should be every opportunity for discussing matters both scientific and commercial, calculated to advance the industry in the West Indies.

In dealing with the historical side of cotton growing in the West Indies, Dr. Watts pointed out that the industry originated in St. Kitts. During the last fifteen years it has spread rapidly to other islands, including, it should be remembered, neighbouring foreign possessions. How important the industry is will be recognized from the fact that during the past five years, the output of cotton from the British islands has been 10,498,222 lb., which, taken at an average value of 1*s.* 6*d.* per lb., is worth £787,367 or £157,473 a year.

The output of Sea Island cotton from the several British West Indian islands during the past five years was shown by Dr. Watts to have been as follows :—

Barbados		2,180,032 lb.
St. Vincent		2,110,613 ,,
Montserrat		1,715,773 ,,
Antigua		765,137 ,,
St. Kitts-Nevis :		
St. Kitts	1,806,284	
Nevis	1,249,875	
Anguilla	485,997	3,542,156 ,,
Virgin Islands		184,511 ,,

Continuing these statistical considerations, the speaker called attention to the fact that the importance of cotton to the individual islands themselves varies very greatly. In order to show the value which cotton bears to the total exports from each Colony, the speaker exhibited a set of tables the most significant figures in which are reproduced for the benefit of our readers below :—

COTTON PER CENT. OF TOTAL EXPORTS.

Period.	Barbados.	St. Vincent	Montserrat.	Antigua.	St. Kitts-Nevis.	Virgin Islands.
1905-7	4·5	23·0	33·6	7·4	13·1	5·3
1906-8	6 1	20·7	49·5	8·3	22·2	14·5
1907-9	6·7	29·3	50·8	6·7	12·0	24·6
1908-10	4·8	30·3	50·3	4·2	15·2	28·3
1909-11	4·4	31·9	54·4	3·1	18·7	31·1
1910-12	3·3	33.1	57·4	3·1	21·8	32·3
1911-13	3·1	30·1	59 4	4·7	24·0	33·8
1912-14	2·2	28·1	45·6	...	...	32·7

These figures plainly show that while cotton production is of comparatively small importance in comparison with other industries in some of the islands, as in Barbados and in Antigua, it is of very great importance to others, particularly Montserrat and St. Vincent.

In order to amplify the above information the speaker presented a table showing the quantity of cotton shipped during each of the past seven 'crop years', that is to say, between October 1 of one year and September 30 of the following, for each of the cotton-producing islands.

Dr. Watts then turned his attention to the consideration of others matters. He pointed out that while during the past fifteen years we have learnt a great deal about cotton growing in all its aspects, there are still a great number of problems to be solved. He invited attention to the fact that the yields of cotton per acre obtained in the first few years of the industry were considerably greater than those obtained during the last five. Some of the probable causes, as for example, unpropitious seasons and greater trouble from pests and diseases in recent years, were outlined; but it was felt by the speaker that the matter as a whole required careful discussion with a view to determining what factors predominated in one place, and what in another.

Coming to the question of the relationship between the grower and the spinner, Dr. Watts asked the members present to bear in mind the fact that the requirements of the user are not fully understood by the grower. Similar terms are used by grower and spinner which have different meanings. For instance, strength to the grower is generally taken to refer to breaking point, whereas under this term the spinner refers to qualities which cause the fibres to bind together into a uniform thread. Fortunately, said the speaker, very considerable advance had been made of late in clearing up these difficulties by the researches of Mr. W. L. Balls. His direct connexion at the present time with the Fine Spinners may be regarded as a most fortunate circumstance favouring the West Indian grower. In general, when producing cotton for the spinner, uniformity above everything else should be the main consideration.

Dr. Watts then referred to the effect of the war on Sea Island cotton, and the action taken by the Fine Spinners and Doublers' Association in guaranteeing a minimum price last year. During the last few months the position of the Sea Island cotton market has strengthened in favour of the growers, and this together with a decided tendency towards decline in the American cotton-growing islands, leads one to believe that the West Indian cotton grower may experience an unprecedented measure of safety in the future.

In concluding, Dr. Watts made brief reference to a matter of commercial importance which he dealt with fully later on in the Conference, namely, the possibility of establishing relations with the buyers of fine cotton which, while securing them a safe supply, may at the same time put the grower in a better position and enable him to dispose of his crop promptly, and at reasonable prices.

At the request of the President, Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts-Nevis, read a statement having regard to the general position of the cotton industry in that Presidency. It was decided that before this statement was discussed, similar ones should be read by the Agricultural Officers representing the other islands. Subsequent to this, it was decided, a useful comparative discussion should ensue.

In his statement, Mr. Shepherd showed that there was a considerable reduction from 5,500 acres in 1914 down to 2,200 acres in 1915-16 on account of the war. In 1914, although the yield of cotton was poor the quality was excellent, and prices ruled from 1*s.* 8*d.* to 1*s.* 10½*d.* per lb. Mr. Shepherd

*For a general account of the Conference, see page 120 in this issue.

stated that the past season has been an unfavourable one for cotton on account of excessive rainfall, but he believed that the industry itself was in a sound condition, and that in spite of the war, it was probable—even notwithstanding the present high price for sugar—the acreage under cotton will be increased in the coming season to almost the normal amount.

In regard to Nevis, Mr. Shepherd's statement referred principally to the peasant growers of cotton. Their difficulty in a former season in obtaining an adequate supply of Paris green and lime had been rectified by the Government. The peasant cotton before the war had begun to fetch quite high prices. But after the war the price obtained locally for the seed-cotton was very small and discouraged planting to a considerable extent. After the guaranteed minimum price of 1*s.* 2*d.* was offered by the spinners, the local purchasers offered more favourable terms, but it appears that the peasant had become suspicious and indisposed to plant without some definite assurance that his cotton would be purchased on fair and liberal terms. Mr. Shepherd stated that he considered the only remedy for this was the formation of a scheme similar to that obtaining in St. Vincent, whereby the Government purchase this cotton on a co-operative basis.

Concerning Anguilla, Mr. Shepherd's remarks centred principally around the work of Mr. Carter Rey, who was unfortunately prevented from attending the Conference. Mr. Rey had established the system of purchasing seed-cotton on a co-operative basis from the peasants, which has been the chief means of keeping the industry in a healthy condition in the past. Cotton growing in this island received a temporary set-back by the war, but there is every reason to believe that it will not only recover itself, but become even more prosperous than in the past.

Mr. T. Jackson's statement, dealing with Antigua and Barbuda, showed that there has been a slight reduction in the yield of lint per acre during the last three years owing to climatic conditions. In Barbuda the yield has been generally satisfactory. In Antigua a considerable decrease in area followed the outbreak of war; this reduction is still greater in the present season, there being only 440 acres of cotton planted in Antigua, against 1,152 acreas planted in 1913-14.

As in the other islands, systematic plant selection for seed supply has been practised by the Agricultural Department.

In dealing with the position in Montserrat, Mr. W. Robson referred to the reduced yields obtained between 1911-13 inclusive, and put this down to the absence of rainfall in increasing amounts during the four months succeeding planting.

The area under cotton planted in Montserrat reached a maximum in the season 1911-12 when 2,700 acres were put in, and since that time it has ranged from 2,000 to 2,350 acres, and is probably below 2,000 acres for the past season.

There has been a gradual change to earlier planting in Montserrat, much being planted in April.

In connexion with the care of the crop, each season seems to emphasize the need for providing shelter for cotton fields against wind.

The cotton worm, the cotton stainer and leaf-blister mite remain the outstanding insect pests.

A Cotton Ordinance came into force in 1915 providing for the destruction of old plants, thereby establishing a close season.

From Mr. Sands' statement concerning St. Vincent, it appears that the acreage planted for the 1915-16 crop was 2,621 acres, made up of 1,531 acres planted by estates and 1,019 acres by small growers. The average area of the annual planting of the previous five years had been 4,200 acres.

The low mean yield of 68 lb. of lint per acre and the high percentage of stained, namely 31 per cent. clearly showed that in the past season the planters were faced with very serious conditions. The high percentage of stains is associated with the attacks of internal boll disease.

The average yield of lint per acre for eleven years in St. Vincent was 122 lb.

The opinion was expressed that unless sufficient inducement in the way of prices is held out to local growers of Sea Island cotton, the acreage may be still further reduced and the land devoted to crops of a more reliable nature.

Good prices have been obtained for Marie Galante cotton. The outlook for the coming season for this crop is hopeful.

(To be Continued.)

SEA ISLAND COTTON MARKET.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 19, 1916, is as follows:—

ISLANDS. The market has been very quiet with apparently no demand. The offerings are very limited, the unsold portion of the crop consisting of only 200 to 250 bales, classing fine to fully fine, held at 29c., to 30c. and one planters's crop held at 32½c.

We have only to confirm our previous advices.

We quote, viz.:

Extra Fine	30c. = 19½*d.* to 20*d.*	c.i.f. & 5 per cent.
Fully Fine	29c. = 19*d.*	,, ,, ,, ,,
Fine	28c. = 18½*d.*	,, ,, ,, ,,
Fine off in class	27c. = 18*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. There continues a demand taking the offerings at full prices, the buying being on account of the Northern Mills. The unsold stock is firmly held by a limited number who are not willing sellers at prices current, as they anticipate even higher prices later on in consequence of the advance paid for Egyptians. Therefore, we quote the market firm at quotations.

We quote, viz.:

Fancy	30c. = 31c.,	landed.
Extra Choice	29c. = 30c.,	,,
Choice	28c. = 29c.,	,,
Extra Fine	27c. = 28c.,	,,

The exports from Savannah for the week were, to Northern Mills 498 bales, Southern Mills 155 bales, and from Jacksonville to Northern Mills 93 bales.

This report also shows that the tolal exports of Sea Island cotton from the United States to Liverpool and Manchester up to March 11, were 658 and 443 bales, respectively.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with modern ideas in regard to the conduct of field experiments. Their careful consideration in connexion with future work in the West Indies is desirable.

On pages 114 and 115 is a review of the report on experiments with sugar-cane conducted in Antigua and St. Kitts, 1914-15.

The first day's proceedings at the West Indian Cotton Conference are summarized on pages 118 and 119.

Insect Notes deal with the banana weevil, and with some pests in British Guiana: under Plant Diseases will be found some important results concerning the internal disease of cotton bolls.

West Indian Cotton Conference.

The West Indian Cotton Conference held under the auspices of the Imperial Department of Agriculture in the Presidency of St. Kitts, March 13 to 18, was in every respect a success. A summarized account of the first day's proceedings will be found on another page of this issue, and further instalments will appear in subsequent issues. The thanks of the Imperial Department are due to the local Organizing and Reception Committee for the manner in which arrangements were made to facilitate the conduct of the proceedings, and for the generous hospitality shown to all the visiting delegates in regard to entertainment at the conclusion of each day's work.

The following is a list of the delegates:—

St. Vincent—Mr. S. C. Harland, B.Sc., Assistant Agricultural Superintendent: Leeward Islands—Dr. H. A. Tempany, Government Chemist and Superintendent of Agriculture; Montserrat—Mr. W. Robson, Curator, Botanic Station, Mr. K. P. Pencheon and Mr. S. W. Howes; Antigua—Mr. T. Jackson, Curator, Botanic Station, Hon. R. Warneford, and Captain J. T. Dew; Barbuda—Mr. G. Sutherland, Government Manager; Nevis—Mr. W. I. Howell, Agricultural Instructor, Hon. J. S. Hollings, Mr. J. O. Maloney, and Mr. J. Sampson; St. Kitts—Mr. F. R. Shepherd, Agricultural Superintendent, Mr. A. O. Thurston, Mr. J. K. Yearwood, and Mr. A. M. Reid; Anguilla—Mr. Carter Rey (absent owing to indisposition).

The officers of the Imperial Department of Agriculture present were—The Imperial Commissioner of Agriculture (Dr. Francis Watts, C.M.G., President of the Conference); the Scientific Assistant (Mr. W. R. Dunlop, Honorary Secretary to the Conference): the Entomologist (Mr. H. A. Ballou, M.Sc.), and the Mycologist (Mr. W. Nowell, D.I.C.).

The Conference was formally opened by His Honour the Administrator, St. Kitts-Nevis (Major Burdon, C.M.G.), who attended the greater number of the sessions. Hon. T. E. Fell, Colonial Secretary of Barbados, was also present at the Conference.

Rainfall in Dominica, 1915.

Copies of rainfall returns of Dominica for 1915 have been forwarded to this Office by Mr. Joseph Jones, the Curator. From these it is gathered that the mean rainfall for thirty-four stations was 137·11 inches: for eleven Leeward Coast stations 103·31 inches: three Windward stations 150·31 inches: thirteen Inland stations 169·76 inches: seven Lasoye stations 123·92 inches. The highest precipitation, namely 289·81, was recorded at Gleau Manioc, this being followed by Corlet with 202·78 inches. The lowest total fall was 70·60 inches, registered at Batalie. The precipitation seems to have been fairly generally distributed throughout the colony, only six stations registering below 100 inches.

Vitamines.

As explained in the *Agricultural News*, Vol. XIV, p. 345, vitamines are complex substances of indefinitely known composition, which in minute quantities regulate the processes of life. Their action is supposed to be connected with the production of some of the essential hormones, internal secretions, enzymes, etc., upon which metabolism depends. Lime juice contains an antiscorbutic vitamine, hence its value as a preventive against scurvy.

Knowledge of the chemical nature of vitamines has progressed slowly; but quite recently an important contribution to knowledge has been made by Casimir Funk (*Biochemical Bulletin*, Vol. V, No. 17, January 1916), in which he describes a method of isolating the vitamine from yeast. Briefly it appears that phosphotungstate precipitate from alcoholic extract of yeast can be divided by means of acetone, into two fractions: a small insoluble fraction, which contains the bulk of the vitamine; and a large soluble one, which is totally inactive.

Fibre and Cotton in the Belgian Congo.

Since the occupation of most of Belgium by the Germans, the official organ of the Department of Agriculture for Belgian Congo, the *Bulletin Agricola du Congo Belge*, has been published provisionally in London. From the issue of this publication for March-June 1915, it would appear that an industry in fibre at some stations in that huge territory gives promise of good results in the future.

At the experimental station of Congo da Lemba, which is situated on a plateau of some elevation in the province of Bas Congo, various species of Agave have been tried. The soil is deep and permeable, while the rainfall only amounts to an average of about 40 inches per annum. The two fibre plants which yielded good returns were *Agave rigida*, var. *sisalana* (Sisal hemp), which gave a little more than 2 per cent. of clean fibre on the weight of leaves; and *Agave cantala* (another Sisal hemp), which gave a little less than 2 per cent. of fibre. The Director of Agriculture, M. Droussie, thinks them worthy of attention.

From another station, Nyangwe, in the Eastern Province, a report is published of experiments with various kinds of American and Egyptian cottons. Previous to the cotton planting, the fields had been under cultivation for some time. The rainfall would appear to be about 42 inches per annum. Samples of the various cottons were submitted to a cotton expert, who reported very favourably on them, especially with regard to Egyptian Sakellarides.

The cottons experimented with were the following:—

Mit-Afifi	yielding	456·5	kilos	per hectare	of lint.
Sunflower	„	234·4	„	„	„
Triumph	„	274·5	„	„	„
Simpkins	„	259·2	„	„	„
Nyassaland	„	123·9	„	„	„
Abassi	„	32·7	„	„	„
Sakellarides	„	98·2	„	„	„

A kilo = $2\frac{1}{5}$ lb., and a hectare = $2\frac{1}{2}$ acres.

History of the Ceylon Botanic Gardens.

In *The Tropical Agriculturist* (January 1916) is given an interesting summary of the history of the Royal Botanic Gardens at Peradeniya, Ceylon, the most famous tropical Botanic Gardens in the world.

It would seem that as far back as 1799, three years after the permament occupation of Ceylon by the British, the advisability was recognized of establishing botanic gardens there, not only for the observation of the native trees and plants, but also for the introduction and acclimatization of desirable foreign plants. A trained horticulturist from Kew, Mr. Kerr, was appointed superintendent, and a botanic garden started. The first two sites selected did not prove suitable; and it was not until 1821 that the present site at Peradeniya was selected by Mr. Moon, the superintendent who had succeeded Mr. Kerr. Mr. Moon did not long survive to direct the progress of the new gardens, and after his death, until 1844, the gardens were comparatively neglected.

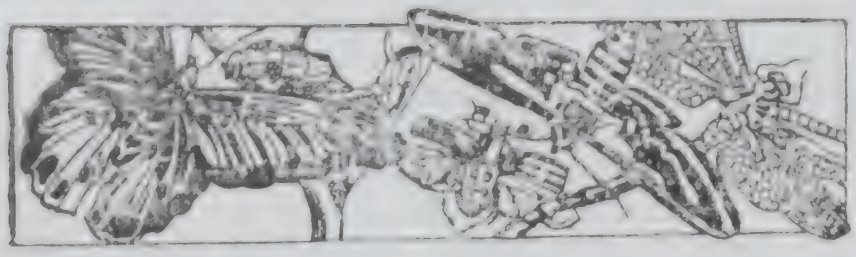
In that year, however, on the appointment of Dr. Gardner, an enthusiastic botanist, the gardens entered upon an era of activity, which may be said to have increased up to the present time, with no signs of diminution.

Dr. Thwaites, another distinguished botanist, succeeded Dr. Gardner in 1850, and held the post for over thirty years. During his tenure of office two new developments took place: two branch gardens were opened, one at a higher elevation for experimenting with cinchona, and other products suitable for growth under such conditions, and another for the introduction of the Hevea rubber tree, and for experimental cultivation of low-country tropical products. It is not too much to say that these two departures of the Ceylon gardens have had very far-reaching effects on tropical agriculture. It is fitting that a monument to Dr. Thwaites now occupies a prominent position in the Peradeniya Gardens.

In 1880 Dr. Trimen succeeded Dr. Thwaites, and held office until 1896, when he died, practically in the midst of his work. Like his two immediate predecessors he was a botanist of world-wide fame, and in addition to his scientific work, he took a lively personal interest in the gardens, where he inaugurated many improvements in the appearance of the grounds.

On the death of Dr. Trimen in 1896, Dr. J. C. Willis was appointed to succeed him. The work of the Director had so increased that it was found necessary to appoint a staff of expert assistant officers. When in 1911 Dr. Willis resigned to become Director of the Botanic Gardens at Rio de Janeiro, he left the Ceylon Gardens in a position of increased utility and efficiency.

In 1912 the Government of Ceylon determined to form a Department of Agriculture, and Mr. R. N. Lyne was appointed Director of Agriculture at the head of seven separate Divisions, each under a responsible and experienced head. The result of this arrangement has been to extend the scientific and practical work immensely, the last development being the opening of an Agricultural School.



INSECT NOTES.

INSECT PESTS IN BRITISH GUIANA

An interesting chart entitled, Common Insect Pests of Garden and Field Crops in British Guiana, by G. E. Bodkin, B.A., etc., Government Economic Biologist, has recently been issued by the Board of Agriculture, British Guiana.

This chart contains in a condensed form a considerable amount of information with regard to insect pests and their treatment, under suitable headings. The following summary of the contained information is given under the several headings of the chart.

ORIGIN OF INSECT PESTS. The sudden increase of any insect to a point where it becomes a pest may be due to three causes: (1) abundant food supply, (2) decrease of natural enemies, (3) favourable climatic conditions. The destruction of birds is often a cause in the increase of insects: the burning of canes before reaping, as practised in British Guiana, results in the destruction of valuable parasites of cane pests.

LIFE DEVELOPMENT OF INSECTS. Insects may be divided into groups, such as, butterflies and moths, beetles, scale insects, grasshoppers and locusts, ants and plant bugs.

BUTTERFLIES AND MOTHS. The life of the butterflies and moths include four distinct stages: the egg, the larva (which is called the worm or caterpillar stage), the pupa or chrysalis, and the adult or winged insect. Moths, generally speaking, fly during the night only, and rest in the day, while the butterflies are day fliers.

Beetles go through the same four changes as the butterflies and moths: the larva generally lives in the ground or in decaying wood or similar concealed situations, and consequently is less well known than the adult. The wings of the adult are concealed beneath a pair of hard wing covers.

SCALE INSECTS. Great variety of form is found among these insects. The usual appearance is that of a small scale or shell-like body closely adhering to leaves, fruit or bark. The insect itself is usually found beneath the scale or shell-like covering. Scale insect attack is usually accompanied by black blight.

GRASSHOPPERS AND LOCUSTS. When first hatched from the egg these have much the same form as the adult insect, only the wings are undeveloped.

ANTS. Ants invariably live in colonies, forming nests under stones, the bark of trees, beneath boards, or in the ground. They go through the same four stages of development as the butterflies, which are all to be found in the nests. The adult is the most familiar form.

PLANT BUGS. These occur in a variety of forms. They possess a long proboscis which is carried beneath the body when it is not in use for piercing the plant tissue and sucking sap. They pass through the different stages seen in the locusts.

PREVENTIVE AND REMEDIAL MEASURES. As a preventive measure, good and careful all-round cultivation is recommended as essential in dealing with pests.

Remedial measures consist in:—

1. The exercise of sound common-sense
2. The use of insecticides.
3. Hand picking.
4. Cultivation methods.
5. The use of some mechanical contrivance to collect and kill the insects, e.g., trap lights.
6. Encouragement of bird life and parasites.

INSECTICIDES. These may be divided into two classes:—

1. Those that act as stomach poisons.
2. Those that act by contact or asphyxiation.

Lead arsenate is mentioned as an example of a stomach poison. This may be used in water as a spray, or in a dry form dusted on the plants. When used as a spray the proportions are 4 lb. lead arsenate to 50 gallons water.

Kerosene emulsion and resin compound are given as examples of contact poisons, with directions for their preparation and use.

Carbon bisulphide is given as a substance which acts on insects by asphyxiation, and its use for fumigating stored grain is mentioned.

The central portion of the sheet on which this chart is printed is occupied by information as to the treatment of certain pests. These are given under their crop hosts or food plants, with the common name of the pest, a popular description of the same, and brief suggestions for remedial treatment.

The following pests of crops are mentioned:—

SUGAR. Giant moth borer (*Castnia*), small moth borer (*Diatraea*), leaf-eating worms, weevil borer, mealy-bug, wood ants or termites.

RICE. Leaf-eating worms.

COCO-NUT PALMS. Borer, scales, leaf-eating worms (*Brassolis*), cockles (beetles).

PARA RUBBER. Couchi ants or umbrella ants, leaf-eating worms, scales, locusts.

CITRUS FRUITS. Couchi ants or umbrella ants, scale insects.

EGG PLANT OR BOULANGER. Leaf-eating beetles.

PEPPERS. Leaf-eating worms.

CASSAVA. Leaf-eating worms.

SWEET POTATOES. Weevils.

COFFEE. Scale insects, ants.

CACAO. Scale insects.

The following accounts of insect pests are copied as examples of the means of describing the pests and suggesting the treatment to be employed.

SUGAR-CANE. Giant moth borer, (*Castnia.*)

Description. The larva bores into the rooting system and lower portion of the stem of the cane. It is a large white worm with powerful jaws, about 2½ inches in length. The chrysalis is dark brown in colour and is found in a rough cocoon composed of cane fibre. The moth has a wing expanse of about 3 inches. The general colour of the wing is dark brown with a broad transverse stripe across each of the upper and lower wings. The margin of each hind wing has a row of yellow spots.

The moth flies by day and particularly during the bright sunshine. The eggs are dropped singly by the moth, usually in the axils of the leaves.

Remedies. Numbers of the moths may be caught by means of hand nets at certain times during the day. Directly after a field of canes has been cut, vigorous search should be made for the worms of the borer in the stumps of the canes, and as many worms and chrysalids as possible thus secured.

Birds should be encouraged in Castnia infected areas, especially the old witch, Kiskeedee, and certain species of Hawks. Perches may be erected about the fields for their convenience.

SWEET POTATOES. Weevils.

Description. Two species of weevils one small and

dark brown in colour, the other somewhat larger with a metalic appearance, injure the potatoe itself by boring into it and causing its partial decay.

Remedies. Both are difficult pests to control. Healthy slips only should be planted, and the potatoes dug as soon as they are ripe. A rotation of crops will often free the land of them.

The foregoing indicates the manner in which the pests and their treatment are dealt with. The chart contains much useful information, but it would seem that the same information in the form of a pamphlet or bulletin would be more conveniently used; and also in bulletin form the opportunity would be presented of somewhat extending and amplifying the information given above under certain headings, which in the chart form have been curtailed, perhaps, too much.

THE BANANA WEEVIL.

In a recent number of the Jamaica *Gleaner*, there appeared a lecture deliverd at Hope, by Mr. A. H. Ritchie, B.A., Government Entomologist, on the occurrence of the banana weevil in Jamaica. This insect was also lately referred to in the *Journal of the Jamaica Agricultural Society*.

From these references it appears that the banana weevil (*Sphenophorus sordidus* = *Cosmopolites sordida*) has appeared in some numbers in certain districts in Jamaica.

This insect appears to be very widely distributed throughout the tropics of the world, being found in Jamaica, Guadeloupe, Dominica, Martinique and Trinidad, in the West Indies; Brazil, in South America; and in the Philippines, Fiji, Borneo, Sumatra, India, Queensland, and Straits Settlements in the East.

There are in the genera Metamasius, Sphenophorus, and Cosmopolites, several weevils closely related to each other and to *Cosmopolites sordida*, which attack bananas in many localities; but while these perhaps attack other plants also, the insect which is now being designated as *Cosmopolites sordida* appears to attack bananas only.

In Fiji, the banana weevil has become seriously abundant, and in 1912, the Government Entomologist, Mr. F. P. Jepson, visited Java in quest of natural enemies of this pest. He was successful in finding a Histerid beetle, which in both adult and larval stages is predaceous on the grubs of the banana weevil. He successfully introduced this predaceous beetle into Fiji.

In 1900, the banana weevil developed a serious attack on plantains in Dominica, and more recently it has been found in some numbers in Martinique and in Trinidad.

This insect would appear to be one which has been carried from place to place in banana plants distributed for purposes of propagation, and has probably existed for some time in most, if not all, the localities where it now occurs.

Its mode of life renders it a difficult pest to control. The egg, larval and pupal stages are passed in or on the bulb of the banana or plantain. The adults do not move far from the place where they have lived and developed so long as suitable food is available to attract the egg-laying female.

The spread of the insect from one locality to another is probably accomplished by the transportation of infested suckers for planting, and its spread within any locality most likely follows the killing out of infested stools, when the adults would travel in search of fresh supplies of food plants

The digging out and destroying of all stools of plantain and banana found to be infested, and the planting of suckers free from infestation would appear to be the only practical remedies for checking the increase of the pest, at present known.

H.A.B.

RE-AFFORESTATIONIN ANTIGUA.

The re-afforestation plots planted some twelve years ago by the Agricultural Department have, on the whole, made good progress, and that situated in the boundary of the Botanic Station now contains trees some 20 feet high. In this plot there is growing a miscellaneous collection of forest trees. These consist of Mahogany (*Swietenia Mahagoni*), White cedar (*Tecoma Leucoxylon*), Willow (*Casuarina equisetifolia*), Logwood (*Haematoxylon campechianum*), Algaroba (*Prosopis juliflora*), and others.

The plot at the Camp is composed of shallow stony soil, and is situated in a wind-swept position. The trees here mostly consist of mahogany, which have made normally good growth in spite of unsuitable environment, their average height being between 10 and 12 feet. They are not so thickly planted as those in the other plot, but the trees have borne seeds, and a number of young seedlings are now appearing which will greatly improve it in the future.

These plots now clearly demonstrate that it is possible to re-afforest wind-swept areas possessing soil of an indifferent nature.

In the Annual Report for the year 1911-12, the suggestion was made that the re-afforesting of the catchment area of Wallings reservoir would ensure to it a more constant supply of water. At the time of writing, approximately 50 acres of this area have been planted. A fuller account of this work will be given in next season's report. (Report on Botanic and Experiment Stations for 1914-15.)

EUCALYPTUS IN DOMINICA.

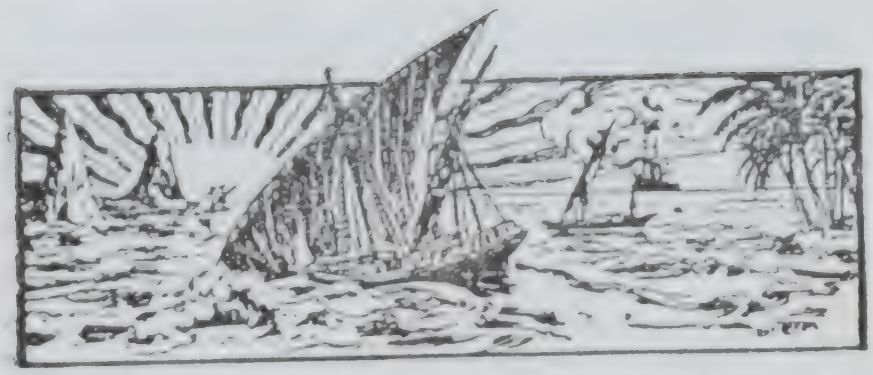
The following were added to the collection of Eucalyptus, which brings up the number of species under obser, vation to seventy-six: *Eucalyptus Boormanni*, *E. bupr estium* *E. capitellata*, *E. coriacea*, *E. Deanei*, *E. goniocalyx*, *E. fasciculosa*, *E. megacarpa*, *E. obtusifolia*, and *E. pleurocarpa*.

In view of the importance of certain species of Eucalyptus as timber trees, the measurements of a specimen of *Eucalyptus citriodora*, which had to be felled in the Botanic Gardens during the course of the year, are of interest. The tree was planted eighteen years before: --

Height of tree				106 feet	0 inches
Girth	3 feet	from	ground	7	0
	20 ,,	,,	,,	5	3
	40 ,,	,,	,,	4	0
	60 ,,	,,	,,	3	3

At the height of 60 feet the trunk branched.

Of the numerous species grown, it would appear, so far, that none is likely to prove superior to, or indeed to equal, *Eucalyptus tereticornis* and *E. citriodora* in rapidity of growth, and in the production of timber. It was fortunate that the kinds found to be best suited to local conditions should have been amongst the earliest introductions to the Botanic Gardens. (Report on Agricultural Department, 1914-15.)



GLEANINGS.

We learn from the Annual Report of the Director of Agriculture, Cyprus, that attemps have been made to grow Sea Island cotton at the Government Experiment Gardens. The plants, although making good growth and producing numerous bolls, failed to ripen them. It is understood that the experiments are going to be continued.

According to *Revista Industrial y Agricola de Tucuman* for November 1915, certain Javan and Barbadian seedling canes have been included in the experimental trials in the Argentine. It is stated that B.3277 has proved satisfactory, showing a high purity and ease of crushing. It is recommended for cultivation in some of the cane-growing areas of North Argentine.

We have received from British Honduras the usual brief report on the Botanic Station. The present publication is for the year 1914. It has regard entirely to the nursery work conducted within the station. It would be an advantage if an effort could be made to extend this report somewhat in future years in order that readers outside the colony may gain some insight into the general agricultural activities that are taking place in British Honduras.

The season 1914-15 was a satisfactory one in British Guiana in regard to balata and rubber. In the report on the Lands and Mines Department, it is stated that 1,932lb. of rubber were exported in 1914-15, as against 1,292lb. exported in 1913-14. As well as for the above products, there was a good demand for greenheart timber. This industry on account of high prices held its own, although the quantity actually exported showed a reduction.

The remarks on Agriculture and Nature Study that appear in the Annual Report of the Inspectors of Schools in Trinidad, 1914-15, show that the standard maintained is generally satisfactory. The instructors report progress on the whole, but call attention to the inadequate supply of tools in many assisted schools. As regards nature study, its aims and objects appear not yet to be understood by the majority of teachers, but progress is reported in some schools. Appreciation is expressed in regard to the publications of the Imperial Department of Agriculture, which are distributed among the principal schools.

Notes on the essential oil market in the *Perfumery and Essential Oil Record* for February 22, 1916, state that distilled lime oil has, as a result of great scarcity undergone a considerable addition in value, being now 8*s.* per lb. or the same price as the hand pressed, which is unaltered on the market. It is stated in connexion with Bay oil: 'Bay oil is unchanged at 13*s.* to 13*s.* 6*d.* per lb.; the experiments in Montserrat to improve production processes, outlined on another page, are interesting, especially to distillers.'

A statement is made in the *Australian Sugar Journal* for January 6, 1916 to the effect that the Federal Government will endeavour to assist in the control of the cane grub pest in Queensland by the appointment of a Federal Entomologist. The appointment is to be very highly paid, and for two years in the first instance. The opinion in Queensland appears to be that the cane grub problem will not be any quicker solved by such action; they consider that what is wanted is a special State Entomologist who can confine his whole time to the problem until a satisfactory solution has been arrived at.

It is announced in *Nature* for January 6, 1916, that the Government of British Columbia has presented to the Royal Botanic Gardens, Kew, a magnificent spar of Douglas Fir to replace the old spar which was taken down in 1913 owing to decay. The tree from which the spar was made measured 200 feet in length, 6 feet in diameter at the large end, and 18 inches in diameter at the small end. Considerable trouble was experienced, as may be imagined, in transporting this huge obstacle from the Columbian coast to Kew. The staff in its finished condition is 215 feet in length, 33 inches at the butt, and 12 inches at the top. Its weight is about 18 tons. Its erection in the Royal Botanic Gardens will be an operation of considerable magnitude.

The nutritive value of new and old maize is the subject of a note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for March 1915. The aim of the investigations on which this note is based was to determine the nutritive value of the last maize harvest and that of older crops. The only regrettable feature of the experiments appears to be that they were conducted on fowls and mice instead of upon larger animals of greater economic importance. However, the results may be expected to have some general biological application. They showed that new maize is less capable of being digested and assimilated than maize some seasons old, and that mice suffer more than fowls from a prolonged and exclusive maize diet. Figures are given in support of this conclusion.

The latest report from the British Cotton Growing Association refers to the fact that the grant of £10,000 from the Imperial Government expires on March 31, 1916. It is stated that the Government have recognized the necessity of the continuance of the Association's work in the different colonies, and a sum of £1,000 has been granted for the year 1916-17. The Government expressed satisfaction that it has been possible, notwithstanding the present urgent need for economy, to continue on a small measure their financial assistance towards the cost of the work of the Association, and they appreciate the fact that the Association will be prepared to continue its operations on the same basis as hitherto, except in the Gold Coast and Nigeria where it has already been decided to close down the work.

VEGETABLE GROWING FOR CANADIAN MARKETS.

Mr. T. Jackson in his Annual Report on the Experiment Station, Antigua, states that the view has been held for some time, that a considerable opening existed in Canada for the marketing of vegetables grown in the West Indian islands during the winter months. In order to test the possibilities involved, a series of somewhat extensive small scale commercial experiments was conducted during the year by the Agricultural Department in co-operation with planters. Seeds of various vegetables were procured and distributed to persons concerned, and subsequently the produce was packed at the Botanic Station and shipped through the Department. The vegetables experimented with, were as follows: tomatoes, pumpkins, English potatoes, sweet potatoes, musk and water melons, cabbages, egg plant, squash and string beans.

The outbreak of war with the subsequent high freight rates, handicapped the work to some extent.

The results obtained in respect of the vegetables are detailed below.

TOMATOES. The tomatoes sent forward arrived at their destination in poor condition and had to be destroyed. It would seem that with our present knowledge of packing, etc., these cannot be sent on a long voyage with any degree of confidence. The tomatoes were packed in onion crates, and it would seem that when sent forward in such packages, the danger of bruising is great. The orthodox tomato box will for future trials be used.

PUMPKINS. It would seem that pumpkins can be shipped North in the winter months with a fair amount of confidence. Eight barrels of these were shipped, and the price obtained in Canada worked out at approximately 1*d.* per lb. At this figure the growing of pumpkins would be profitable.

These vegetables were sent up in well ventilated barrels packed tightly in straw. On the steamer they received no special attention, being sent forward as general cargo.

ENGLISH POTATOES. Ten barrels of these were sent to Halifax during the month of February. They were not packed under the supervision of the Agricultural Department, but the work was done on an estate. They arrived at their destination in a slack condition, and it was stated that they were much too small for the requirements of that market, and were sold at a very poor price, 16*s.* 8*d.* being the gross amount received. When commenting on this shipment, the agents said that had the potatoes been twice that size at that time of the year we could have got all kinds of prices for them.'

SWEET POTATOES. One trial barrel of these vegetables was sent North during the latter end of March. They arrived at their destination in good order, and £1 1*s.* 4*d.* was obtained for them. This figure represents a gross return of approximately 1½*d.* per lb., a price which undoubtedly would prove remunerative under normal conditions. These potatoes were packed tightly in well ventilated barrels.

MUSK AND WATER MELONS. A small barrel of melons, packed in straw and shipped in cold storage, was sold at the rate of 2½*d.* per lb. This price indicates that at least a small lucrative trade might be started in connexion with these.

CABBAGES. The cabbages which were sent to Canada arrived in a somewhat unsatisfactory condition. It would seem that these vegetables should not be packed for shipment until some forty-eight hours after reaping. The lot under discussion were evidently damp when packed, which accounted for their condition on arrival.

MISCELLANEOUS. In addition to the above, small shipments were made of squash, egg plant and string beans. The squash and the string beans arrived decayed, and the egg plant fruits were sold for 1½*d.* per lb.

In connexion with these experiments, it may be said that a considerable amount of valuable experience has been obtained which will be useful in the future. There is little doubt that with care a lucrative industry could be built up between Canada and some of the West Indian islands with the shipment of vegetables during the winter months. Before this assumes large proportions, however, fairly numerous experimental shipments will have to be made, and a proportion of these will almost certainly be failures.

ONIONS. The export of onions from Antigua, as our readers will be aware, is a well established trade in Antigua. Most of these vegetables are shipped to New York rather than to Canada. These onions, which are graded, take the market just before the Bermuda crop comes in, and so secure good prices.

Pasturing Pigs on Rape.—A lengthy note concerning this subject appears in the *Experiment Station Record*, Vol. XXXIV, No. 2. It is stated that a 4-acre plot of rape, soy beans and sweet clover pastured an equivalent of sixty days by thirty spring pigs produced, deducting grains made by corn, 1,854 lb. of pork. It was observed that the pigs preferred the bean forage and that the rape was next in palatability. Mr. T. Jackson has written from Antigua to point out that rape can be grown in that Colony and might be used as a forage crop in the raising of pigs in accordance with Dr. Watts' scheme already referred to on different occasions in this Journal.

An even more suggestive announcement in connexion with the same matter is to be found in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for September 1915. After clover, according to these experiments, which were extensive, rape may be considered to rank next as forage for pigs. It is stated that it should not be pastured until it is from 12 to 15 inches high. With a moderate maize supplement 1 acre will feed fifteen to twenty pigs. Experiments at various stations in North America give rape a feeding value of about $20 per acre. At the Missouri Station, 1 acre of rape and oats pastured ten pigs for 107 days. For each pound increase of live-weight 3·28 lb. of maize were required, and the pork accredited to forage was 308·7 lb.—a return of $22·84 per acre.

The final general memorandum on the indigo crop of 1915-16, based upon reports received from provinces containing practically the whole area under indigo in British India has been issued by the Department of Statistics, India, and forms the subject of a short article in the *Chemical Trade Journal* of January 29. The total area (314,300 acres) is 112 per cent. in excess of the finally revised value of last year (148,400 acres). The total yield of dye is estimated at 39,900 cwt., as against 25,200 cwt., or an increase of 58 per cent. The average output per acre works out at 14 lb., as against 19 lb. in the preceding year. The increase in area is due to high prices of indigo due to the war, which range from 2*s.* 8*d.* in 1913. The season, on the whole, has not been favourable to the crop, except in Madras. In some places poor crops were obtained owing to a scarcity of trustworthy seed at the sowing time. Data are given showing the quantities of natural and synthetic indigo imported into the United Kingdom in the last five years (*Nature*, February 10, 1916.)

DISEASES OF PLANTS.

THE INTERNAL DISEASE OF COTTON BOLLS.

In continuation of the articles on the above subject published in this Journal, Vol. XIV, pp. 222 and 238, the following further information is now given.

Mr. W. Robson, Curator of the Botanic Station, Montserrat, carried out some further experiments during the past season to test the connexion of cotton stainers with the disease. Two muslin cages were used, erected over single plants in a field from which stainers appeared to be absent. In the one cage stainers in large numbers were confined, from the other they were excluded. Two trials were made, one in August and one in September, with the following results:—

	Healthy bolls.	Slighted affected.	Severely affected.
Infested plant	26	16	4
Control	29	none	none
Infested plant	6	14	12
Control	43	1	1

Duration of first experiment ten days, of second fifteen days.

With regard to the badly diseased boll in the second experiment, Mr. Robson stated his belief (since confirmed) that the green bug *Nezara viridula* is capable of originating the disease, and suggested that the boll may have been punctured by this insect before enclosure.

In January 1916, the following experiments were carried out at the St. Vincent Experiment Station by Mr. S. C. Harland, B.Sc., Assistant Agricultural Superintendent.

EXPERIMENT. 1.

Six plants from a plot of Sea Island cotton with 98 per cent. diseased bolls had the bolls removed. Three were placed under a muslin cage and three were left uncaged. Three weeks later the bolls from each plant were examined.

RESULTS.

Caged Plants.

No. of plant.	No. of bolls.	No. of diseased bolls.	Remarks.
1	15	none	One stainer was found under the cage.
2	10	2	
3	13	none	

Uncaged Plants.

No. of plant.	No. of bolls	No. of diseased bolls.	Remarks.
1	10	9	
2	14	12	
3	9	8	

EXPERIMENT 2.

A Brazilian cotton was selected which was growing in an isolated position. There were no stainers on the plant and an examination of fifteen bolls showed that no internal boll disease was present.

Ten of the remaining bolls were enclosed in muslin bags. In five of the bags a pair of stainers was imprisoned. The bolls were examined ten days later.

RESULTS.

Bolls with stainers. 4 showed definite disease.
1 „ proliferations with doubtful disease.

Bolls without stainers. All 5 were quite healthy.

Bolls from both the Montserrat and St. Vincent series of experiments were preserved and forwarded to this Office for examination, and the disease found to be due to the specific fungus mentioned in the previous article. All the facts ascertained point to the conclusion that the disease is either carried by, or supervenes upon the attacks of plant-feeding bugs.

Early in January this year the writer found bolls with the same affection on a self-sown plant of the perennial type growing on waste land in Barbados. Cotton stainers are not found in Barbados, and there is no such return of stained lint as occurs in the case of the other islands.

On the plant referred to, a few adult green bugs (*Nezara*) were present. When these soon afterwards disappeared the new bolls ceased to become affected, but the disease reappeared as a new brood developed. A period of cessation of growth and defoliation, due to drought, followed and caused the dispersal of the bugs, and the abundant new shoots and bolls now on the plant are free from bugs and from disease

During the recent Cotton Conference in St Kitts, Mr. Harland found internally discoloured bolls on a plot of out-of-season cotton in that island, and the examination of these has revealed the presence of the characteristic fungus. There is a fair proportion of stained cotton produced each year in St. Kitts, but no instance appears to be known of the second picking being practically all affected, as has been the case from time to time on estates here and there in Montserrat and St. Vincent. There appears to be a general agreement among cotton planters that the amount of staining experienced is not at all proportional to the number of stainers present, a numerous infestation sometimes resulting in a smaller amount of stained lint than is produced under certain circumstances when stainers are comparatively few in numbers. The latter condition was well illustrated at the St. Vincent Experiment Station in December of last year. This indicates the necessity for taking the fungus into account as well as the insect, since it seems probable that the disproportion is due to the effect of the prevailing conditions upon the former factor.

It is hoped to obtain by experiment more exact information on the outstanding points with regard to this affection during the next cotton-growing season.

The fungus concerned has very considerable scientific interest owing to its methods of spore formation. It has now been found in material from Tortola, St. Kitts, Montserrat, St. Vincent, and Barbados. It occurs in nearly all the bolls examined, but as indicated in the previous article, in a small proportion it is replaced by bacteria.

The fungus resembles very closely *Ervmothecium cymbalariae*, Borzi, found in Italy in 1888 in the capsules of *Linaria cymbalaria* by Borzi, and again in France (1906-12) in the fruits of an Umbelliferous plant (*Cachrys laevigata*) by G. Arnaud (*Bull. de Soc. Mycol. de France*, XXIX, 572-5). In addition to the sporangia described by Borzi,

Arnaud found a second form which he calls macro-sporangia, which closely resemble the sporangia of *Nematospora Coryli*, Peglion, found in Italy in mouldy hazel-nuts. Sporangia exactly corresponding to both these types are found in the affected cotton bolls, sometimes separately, sometimes together. Some doubt has been felt as to whether they belonged to the same organism, but the association of the two forms in such widely different circumstances, as shown by Arnaud's observation, greatly strengthens the presumption, already made on other grounds, that they are alternative forms of the same fungus. The arrangement and number of the macrospores in the cotton boll fungus are those of Peglion's *Nematospora*, and differ somewhat from those shown by Arnaud for *Eremothecium*; but the form of the macro-sporangium, and that of the actual spores, are very similar in all three cases, and the yeast-like budding of *Nematospora* is characteristic of the corresponding form of the cotton-boll fungus.

W.N.

THE VALUE OF SOIL EXPLOSIVES.

In connexion with the editorial on the question of soil explosives which appeared in the last issue but one of this Journal, the following summary of experiments carried out in Kansas, U.S.A., will be of interest. It will be seen that very little benefit was derived from the use of explosives, the general results being in close agreement with those obtained in the West Indies. All available evidence goes to show that there is in the ordinary way, no advantage in using soil explosives.

A series of experiments was planned to determine the effects of dynamiting on soil, the yield of crops, the moisture content of the soil, nitrate development, the bacterial flora, the physical condition of the soil, the leaching of salts in alkali soil, and the growth and vitality of fruit trees.

The crop planted on dynamited soil produced a higher yield in seven instances, while the crop planted on undynamited soil produced a higher yield in four instances. The greatest increase in yield on dynamited soil was obtained at this station with corn in 1914, when the dynamited plots produced 13 per cent. more grain than the undynamited plots. At Agra the dynamited plots produced 17 per cent. less wheat than the undynamited. In most instances the difference in yield was no greater than would occur on two areas of soil similarly treated.

Moisture determination on a series of nine dynamited and four undynamited plots on the Oswego Silt Loam at Manhattan, extending over a period of three years, showed no marked difference in moisture content of the soil. An average of all the determinations gave less than one-half of one per cent. more moisture in the dynamited than in the undynamited land.

Nitrate determinations on the same plots extending over the same length of time showed no greater formation of nitrates on dynamited than on undynamited soil.

A count of the number of bacteria at different distances from the centre of a dynamited area two years after the dynamiting was done showed a small increase in bacterial content in both the surface and second foot of soil as the dynamited area was approached.

A study of the effect of dynamite on the physical condition of heavy, plastic clay soil showed that the explosion forced out the soil particles at the centre of the dynamite charge into the pore spaces of the soil mass adjoining, thus producing a cavity surrounded by a hard, compact mass. The soil instead of being shattered and cracked, was compacted and puddled, and left in poorer physical condition than before the dynamiting was done.

An alkali soil in the Arkansas River Valley dynamited in the early Spring of 1912, with half-sticks of dynamite placed $2\frac{1}{2}$ feet deep at the corners of 15-foot squares had not been noticeably improved by the fall of 1914. However, there had been some leaching of the salts from the surrounding soil.

Fruit trees planted on dynamited soil at this station in the Spring of 1911 made a slower growth and survived in smaller numbers during the dry seasons following than did trees planted on similar adjoining soil that had not been dynamited.

In no instance was there improvement sufficient to pay expense of dynamiting. (Kansas Agricultural Experiment Station Bulletin, No. 209.)

BRITISH COTTON GROWING ASSOCIATION.

WEST AFRICA. The low prices caused by the War have not resulted in any large reduction in planting, as the monetary assistance given by the Association, in co-operation with the Government, the steamship owners, and the merchants, enabled the farmers to dispose of their crops at fair prices. There have, however, been great delays in marketing the crop, and the congestion of traffic on the Government railway has caused serious losses to the Association. It was pointed out that the extent of the industry depends on whether it can be made more profitable for the grower, and if the quality can be improved and the buying price increased, there are good prospects of a large increase in the growth of cotton. Experiments have been conducted by Mr. Johnson on the Government Farm at Ibadan with with 'Georgia' seed, which have given very good results. This type of cotton gives a much higher percentage of lint than the native varieties, and if it can be successfully established, it is expected that a great stimulus will be given to cotton cultivation in West Africa. Only a small quantity of seed can be raised on the Government Farm, and it was decided that the Association, in co-operation with the Government, should make special arrangements with selected native farmers to plant sufficient seed in order to raise a large quantity to be available for general distribution. The Association have arranged to pay a special bonus of $\frac{1}{4}d.$ per lb. for all seed-cotton grown from Government seed in the season 1916-17. This is estimated to cost £300. The purchases of cotton in Lagos to the end of November amounted to 6,121 bales, as compared with 13,541 bales for 1914. In Northern Nigeria the purchases to the end of November totalled 723 bales, as compared with 653 bales for 1914.

UGANDA. A report from the Director of Agriculture was read on the Cotton Growing Industry in the Protectorate during the 1914-15 season. The report states that the natives have no accommodation for storing such bulky crop as cotton, and as the Ginning Companies refused to purchase cotton except at extremely low prices, there was a big wastage of the product, and much of the crop in a growing condition was uprooted, owing to the absence of a fair market. It is pointed out in the report that the action of the Association in making arrangements to purchase cotton from the natives at fair prices was of the very greatest assistance in saving the situation. Had it not been for the action taken by the Association, the industry might have been permanently ruined, as the natives would have lost all confidence in the crop. The total amount of seed-cotton sold in the Protectorate for the season 1914-15 amounted to $13,757\frac{1}{2}$ tons, as compared with 24,122 tons for the season of 1913-14.

MARKET REPORTS.

London.—The West India Committee Circular, February 24, 1916.

Arrowroot—No quotations.
Balata—Sheet 2*s.* 9*d.* to 2*s.* 11*d.*; block 2*s.* 2½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 88*s.*; Grenada, 79*s.* 6*d.* to 85*s.* 6*d.* Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£37 to £37 10*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 27*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 75/- to 90/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/- to 3/6; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—8*s.* to 8*s.* 10*d.*
Mace—6½*d.* to 2*s.* 6*d.*
Nutmegs—7½*d.* to 11*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 3/1½; fine soft, 2/11; Castilloa, no quotations.
Rum—Jamaica, 5/3 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., March 3, 1916.

Cacao—Caracas, 15¼c. to 15½c.; Grenada, 15¼c. to 15⅝c.; Trinidad, 15½c.; Jamaica, 14c. to 14½c.
Coco-nuts—Jamaica and Trinidad selects, $33·00 to $34·00; culls, $22·00 to $23·00.
Coffee—Jamaica, 9¼c. to 12c. per lb.
Ginger—14c. to 16c. per lb.
Goat Skins—Jamaica, 49c.; Antigua and Barbados, 47c. to 49c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape Fruit—Jamaica, $1·25 to $1·75.
Limes—$4·00 to $5·00.
Mace—35c. to 42c. per lb.
Nutmegs—15c. to 15¼c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—3⅞c. to 4c. per lb.
Sugar—Centrifugals, 96°, 4·83c. to 4·86c.; Muscovados, 89°, 4·18c. to 4·21c.; Molasses, 89°, 4·06c. to 4·09c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 15 1916.

Cacao—Venezuelan, $16·75; Trinidad, $15·25 to $15·50
Coco-nut Oil—$1·13 per Imperial gallon.
Coffee—Venezuelan, 11c. to 12c.
Copra—$7·00 per 100 lb.
Dhal—$7·00 to $7·50
Onions—$8·00 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 22, 1916; T. S. Garraway & Co., March 22, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$17·00 to $18·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $100·00 per ton.
Molasses—No quotations.
Onions—$7·00 per 190 lb.
Peas, Split—$9·50 to $10·00 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·25 to $4·50 per 160 lb.
Rice—Ballam, $7·00 to 7·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·85 to $4·20.

British Guiana.—Messrs. Wieting & Richter, February 29, 1916; Messrs. Sandbach, Parker & Co, Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per lb.	20c. per lb.
Cassava—	$1·80	——
Cassava Starch—	$8 to $9	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9c. per lb.
Dhal—	$7·00 to $7·25	$7·25
Green Dhal	——	——
Eddoes—	$1·20 to $2·16	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·25 to $4·00	$3·25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50
Tannias—	$2·88	——
Yams—White	$1·92	——
Buck	$1·92	——
Sugar—Dark crystals	$3·70 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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The Simplicity of Science.

THE stress arising from carrying on the greatest war of all time has revealed features both of strength and weakness in the British national character and habits; it has most prominently revealed astounding want of knowledge and appreciation of what is commonly referred to as science; and, in consequence, strenuous efforts are being made to remedy so grave an evil. Men's minds are thus directed by stirring utterances in the Press, and by the formation and action of energetic committees and associations, to a consideration of science and what it implies: usually this produces a mental picture of things difficult, abstruse, and possibly unattractive, and it is felt that a strenuous effort will be necessary to induce the mass of men to turn their attention to the things, which while urgently needed, are more or less repellant.

A little consideration will show that our very ignorance of what science really is, is creating the barriers and difficulties that retard our progress along a line so absolutely essential to the national well-being. Science is not necessarily abstruse, it is not necessarily unattractive; it is quite otherwise: it is, over very wide ranges, quite easy and wonderfully interesting.

Science, as Huxley tried to impress upon us many years ago, is merely organized common-sense. There is no difference in the character of knowledge generally acquired and that acquired in the study of science, except that in the acquirement of general knowledge there is commonly little effort at arranging the acquired information in any definite order for future use. Arrange the information in any way that will make it useful on future occasions, and it becomes scientific. When we speak then of the necessity of being more scientific, we only mean that we should be more orderly in our methods of thinking.

The first step in our orderly thinking is to look with intelligence on the things with which we daily come in contact, and to arrange our thoughts in an orderly way about them. It surely is an obvious and trite thing to say that we should be reasonably informed concerning the things and phenomena which we encounter in our daily life. To acquire that information is to study natural science: to label this effort 'the study of natural science' is to run the risk of making it seem difficult, and to take the first step in making it repellant.

A great step will have been made when those responsible for education fully realize that there is no real difference between ordinary and scientific knowledge, and that it is an obvious duty on their part to help the youth of a country to understand the affairs of everyday life: this would be teaching science, and would lead to an acquirement of that characteristic, the absence of which painfully marks so many of our educated Englishmen—the scientific habit of mind. If this were imbued in early youth, as it readily may be, by directing the attention of every child to the natural surroundings with simple, unobtrustive guidance tending to secure orderly thinking, then we should have our race in full possession of a most important faculty, and scientific thinking would become as natural and as unconscious an effort as breathing.

The essential feature is to render the effort unconscious. Vigorous talk about the necessity for scientific study, coupled with mistaken ideas concerning the difficulty and abstruseness of the work, is calculated to defeat its own ends, which must be the acquirement of the scientific habit of mind, and the unconscious exercise of the faculty so acquired.

This implies that all our children, in all our schools shall be afforded opportunities for thinking about the facts in their surroundings, which simply means that they must be helped to think in an orderly way about the plants and animals amongst which they live, about the soil and sea and rivers, and the wind and rain, all those things of which they have daily experience, and concerning which they really know a great deal without the conscious efforts of their teachers. They have much knowledge; it merely remains to the teachers to make it scientific by making it orderly and thus inducing the invaluable national characteristic referred to—the scientific habit of mind. This is the source from which it will spring much more readily than from the conscious efforts of the college and the university.

The scientific habit of mind reveals itself in the scientific spirit exhibited by individuals, and by communities. In its individual manifestation it leads to a critical examination of ideas presented for acceptance; it causes the supporting facts to be carefully weighed, and requires evidence before acceptance: authority counts for little in comparison with the actual weighing of evidence: if the evidence is conclusive, then authority, if opposed, must give way, and the facts must be accepted.

The scientifically minded individual is, therefore, prepared to change his mind as evidence accumulates and facts require: he exhibits little of that unreasoning, dogged pertinacity in which some take pride: but his changes of mind are evidences of strength, not of weakness; of new knowledge acquired, and of new outlooks gained, and not of the vacillation of being blown about by every new wind of doctrine.

In its communistic manifestation the scientific spirit requires that those who lead shall be sound in their methods of thinking and working, and that they shall appeal to what is natural rather than endeavour to play upon men's credulity, or excite their passions or rouse their cupidity. It requires that the reality of things shall be sought, the presentment of them in distorted form in order to gain particular ends, finding no favour. Such a spirit in its endeavour to arrive at truth discourages and kills self-advertisement and the wiles of expediency.

The foregoing mental characteristics can be inculcated without the profound study of technical science, and it is these characteristics which one most desires to see common to every inhabitant of Great Britain, and of the Empire generally.

Much is being done in our West Indian schools of all classes to give effect to these ideas: the Codes of instruction employed have in them features directed to this end, and it is felt that some progress is being made. The early efforts are difficult owing to want of knowledge and lack of sympathetic appreciation, but progress will be manifestly accelerated as the spirit thus engendered spreads through the communities.

Nor will this scientific habit of mind have only an aesthetic effect; it will have a direct bearing on national industries leading to great economic progress, and to wide-reaching economies, the object to which so much attention is now being directed in the vigorous campaign in progress in the Mother Country.

An instance may be given of the economic effect of the artificial acquirement of the scientific habit of mind in a particular case. James Watt took as payment for his engines one-third of the saving of the coal which resulted from their use; this led to accurate measurements and to great savings. When, in 1800, these measurements ceased, deterioration followed. Joel Lean again started these duty trials and published reports. The practice of reporting is thought to have been attended with more benefit to the country than any other single event, excepting only the invention of the steam engine itself.* Here we see the effect of the

*Unwin Forest lecture, *Nature*, May 23, 1895.

scientific habit of mind exercised by conscious effort. Far greater results will follow when the habit becomes automatic and unconscious. This condition can readily be created by quite moderate work in the elementary stages in the education of children, and that without expensive and terrifying efforts at teaching science.

SUGAR INDUSTRY.

Use of Nitrogenous Manures for Cane in Louisiana.—Figures of some interest are published in the *Louisiana Planter* for March 18, to show (1) the relative value of different nitrogenous manures, and (2) the value of calcium cyanamide and calcium nitrate compared with sulphate of ammonia and nitrate of soda. Detailed results of the experiments are not given, so that the results cannot be studied critically; it would seem, however, that sulphate of ammonia has given best results, followed by dried blood, cotton seed meal, fish scrap, nitrate of soda and tankage. As regards the two new manures, calcium cyanamide and calcium nitrate, the mean of two years is as follows: calcium cyanamide gave 25·94 tons cane per acre, calcium nitrate, 29·27, and the control plot 21·77. In another table calcium cyanamide gave better results than calcium nitrate. These results are interesting, in view of the fact that experiments in the Leeward Islands have shown calcium cyanamide to possess little value as a manure for sugar-cane.

British Sugar Consumption.—The Royal Commission on sugar supplies in the United Kingdom, according to the *International Sugar Journal*, have decided to import from 20 to 25 per cent. less sugar during the current year owing to the present great shortage of shipping tonnage, it being held that other articles of import must have precedence in the available ships. It is not proposed at present to raise the retail price to any appreciable extent, so it is left to the public to practise the requisite economy. The *International Sugar Journal* thinks that in view of the high standard of wages now prevailing, the general public will not be likely to reduce their consumption, in which case the Commission will be forced eventually to raise prices to a much higher level, or issue sugar tickets something on the principle of the food cards in Germany. The Journal referred to suggests that some restriction should be placed upon the utilization of such large quantities of sugar for the manufacture of confectionery, particularly that sort commonly classed as 'sweets'. These articles are decidedly indulgencies if not luxuries, and it would seem only reasonable that a reduction in consumption of this class of confectionery should take place. In this connexion it should be remembered that any restrictions might affect the West Indies, not only as regards sugar, but also as regards cacao and the various essential oils used in the manufacture of confectionery.

Motor Implements in Mauritius and Cuba.—We have received from the Director of Agriculture, Mauritius, a statement of particulars respecting motor ploughs which has been placed by him before the Board of Agriculture of that Colony, with a view to increasing the introduction of motor implements for economising labour in the production of sugar. Enquiries have been made in Great Britain, Canada, and the United States as to what motor implements might prove satisfactory for the Colony. Replies have not yet been received from Canada and the United States, but the English Board of Agriculture recommend the Wyles' Motor Plough as being likely to prove suitable to the conditions of the Colony, and reasonable in price to warrant experimental trial on the average estate.

The Director of Agriculture suggests to the Board, that the Governor should be asked to offer the following inducements for estates introducing motor implements: (1) a premium of Rs 750 for the first motor implement which successfully performs in a satisfactory manner cultural work in the sugar-cane fields of the Colony; (2) a premium of Rs. 750 for the first motor implement running on industrial alcohol in the Colony, which successfully performs in a satisfactory manner cultural work in sugar-cane fields of the Colony.

The statement of particulars then goes on to refer to a report of the Director of Agriculture of St. Croix, D.W.I., on motor ploughing trials in that Colony in 1914. These particulars have been published already in the *Agricultural News*.

In connexion with motor implements, it might be added that in the *Louisiana Planter* for March 18, 1916, reference is made to a new development in transportation on sugar estates, namely, the employment of a new Bullock tractor together with a train of five cars. This motor train requires no specially prepared track, and the motor develops 60 h.p., drawing 6·7 tons of cane in each of the five cars.

Influence of the War on the Sugar Industry.—In his article on the influence of the war on the sugar industry, published in the *International Sugar Journal*, Dr. H. C. Prinsen Geerligs says that not in a single country has sugar been lacking, and generally, the price in the countries of production has not risen appreciably. As regards the present position in Germany, it is stated that the human consumption is larger than usual, owing to the enormous demands of the Armies. Germany has reduced her planting of beetroots by one-third. The import of sugar, it is believed, may be obtained without difficulty from Austria.

A very useful article on the sugar industry and the war containing a large number of valuable statistics, is to be found in the Dutch publication *Archief voor de Suikerindustrie in Nederlandsch-Indie*, for January 1916.

While making reference to conditions in Germany, attention may be called to some observations on the depreciation of the mark appearing in Dr. Geerligs' European news letter dated Amsterdam, February 9, and published in the *Louisiana Planter* for March 18. The currency of the mark has fallen in every neutral capital; in Amsterdam it has dropped to about two-thirds of the gold equivalent, so a Dutch merchant ordering German goods quoted in marks, as is the rule, only pays 40 guildercents for one mark instead of 59 as is the case in ordinary times. On the other hand, the German merchant buying sugar or vegetables in Holland pays for the guilder 2·50 marks, instead of 1·70 as he used to do. Efforts to restore the currency of the mark by the Germans are thought by Dr. Geerligs as not likely to be successful.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Work in the Experiment Stations has included the harvesting and distributing of horse beans and the pruning of lime trees at Morne Rouge. At the lime experiment station drainage operations have been completed. The transplanting of limes for the 1916 distribution has taken place. As regards the staple crops in this island, Mr. J. C Moore, the Superintendent of Agriculture, states that the cacao crop is satisfactory on the whole, while the sugar crop is better than last year's. Lime trees are flowering well, but on some plantations better drainage is needed. The plants distributed during February were as follows: Coco-nuts 2,162; grafted mangoes 6; ornamentals 2. The weather during February was not excessively wet.

The monthly report of the Agricultural Instructor for February a copy of which has been forwarded to this Office by the Governor, shows that a useful visit was paid to the island of Carriacou, where three meetings of peasant cotton growers were held, and instructions were given regarding cotton seed selection and cotton cultivation. In regard to the question of selection, the Commissioner of Agriculture is corresponding with the Grenada Department. Concerning work on the experimental plots, the reaping of cowpeas was completed and lime trees were pruned at Morne Rouge. Progress is being made in the matter of road construction at the St. Cyr Mountain Settlement.

ST. VINCENT. Mr W. N. Sands writes to say in connexion with work in the Experiment Station that the onion plot has yielded at the rate of 4,574lb. per acre. Land has been prepared for the progeny rows of selected Indian corn, and Lima beans have been staked with prunings of Gliricidia hedge. The plant distribution during the month consisted of 230 Gliricidia cuttings, 6 lb. of pigeon peas, 2lb. of cotton seed, and 2 lb. selected Indian corn. As regards staple crops, a further extension of cane cultivation is to be noticed.

The S.S. 'Salybia' which left St. Vincent on March 3, and which was sunk off the English coast, carried local produce to the amount of 2,811 barrels of arrowroot and 341 bales of Sea Island cotton. This cotton represented over three-fifths of the past crop, and included nearly all the superfine marks.

The Assistant Agricultural Superintendent represented the Agricultural Department at the Cotton Conference held in St Kitts, the proceedings of which are now being reported in this Journal. It is stated in Mr. Sands' notes that the Agricultural Department is to re-assume control of the Government cotton ginnery on April 1. The rainfall during March in St. Vincent was showery.

DOMINICA. Mr. Joseph Jones (Curator) writes to say that work in the nurseries included the grafting of mangoes, spraying, sawing bamboo pots, and potting cacao. In the lime experiment station all the plots were weeded, and the general sanitation of the plots attended to. Work in the cacao experiment station consisted in the picking and recording of the crop. Several improvements in the Botanic Gardens are in progress.

The lime trees throughout the island are reported to have flowered heavily. During March, green limes unpacked were bought in Roseau for 25s. per barrel

The Government has published in the *Government Gazette* for March 27, certain correspondence regarding green limes. The principal shippers of green limes from Dominica to New York sent a petition to the Quebec Steamship Company pointing out that the green limes were landed in New York last season in the worst condition ever known. The petitioners pointed out that Dominica is one of the Quebec Steamship Company's best freight ports, adding that the shipment of green limes has risen from a few hundred barrels some twenty years ago to a seasonal shipment at the present time of over 30,000 barrels. The petitioners called the attention of the Company to the increased rates they were called upon to pay, but which they were quite willing to do provided the shipment of the produce proved satisfactory. It was added that the shippers in Dominica were giving consideration to the matter of approaching the Government in order that the Quebec Company may be subsidized on the bounty system, that is, on all fruit delivered in sound condition, provided the Company guarantee to limit the quantity of general freight by each boat, and especially to give green limes separate accommodation, and avoid the possibility of sugar and limes being transported in the same hold, and providing the ships avoid staying two or three days in the Danish Islands after the loading of limes from Dominica.

The Quebec Steamship Company replied in a very courteous and satisfactory manner, stating their appreciation of the importance of the green lime trade between Dominica and New York. In this letter it was stated that special instructions had been given to the captains of the steamers in regard to the more careful transport of green limes. It had been arranged that molasses instead of sugar should be stored in the lower hold of the steamer. The captains had been instructed to keep the hatch open over the hold containing the limes whenever weather permitted, and to see that the fans which had been installed were kept running continuously. To create additional interest on the part of the captains, the Company had offered them a bonus to give their personal attention to the storage and carriage of the limes, with a view to landing them in good order. The Company has made futher concession in that if a steamer had to be delayed for several days at St. Croix, it would be arranged to send her back to Dominica for the limes. While admitting that most shipments of limes from Dominica were carefully picked and packed, the Company had to point out that others were not, especially when the market was high in New York. The Company had to insist that in these cases no amount of care and attention on their part could ensure the arrival of the fruit in good condition. Referring to the rate of freight on limes, the Company pointed out the fact that they had not advanced their rate of freight in any comparison with the advance in freight from New York to Europe or to other parts of the world, and if the Company had not desired to protect the West Indian business, it would have used its steamers during the past year in other services which would have paid the Company enormous profits, and the Company is of opinion that shippers should appreciate these facts.

As regards special work done by the Agricultural Officers in Dominica during March, reference may be made to a visit paid to the peasantry in the Grand Bay district, in addition to visits paid to no less than nineteen estates. The Permanent Exhibition Committee has decided not to exhibit at the forthcoming Canadian Exhibition. The plants distributed during the month consisted of the following: limes 1,500, shade trees 300, miscellaneous 43. The total plant distribution for the financial year 1915-16 was 65,700. The rainfall at the Botanic Station during March was 4·52 inches

MONTSERRAT. Mr. W. Robson, Curator, informs us that the work at Grove Experiment Station has consisted chiefly in the transplanting of lime plants, the erection of a nursery shelter for raising bay seedlings, and the preparation of plots for future crops. Two distillations of bay leaves were made, which did not show much improvement in oil yield, which has been low since December. Arrangements have been made to repeat the cotton manurial experiments at Dagenham.

A portion of the cotton crop was planted towards the end of March. With rain, April will see the bulk of the crop put in. Practically all the estates have taken seeds of the closely bred H9 cotton seed for planting a seed field. Arrangements have been made to plant a seed supply field of both the new Douglas (St. Kitts cotton) and H 9 (the local type) in case the former does not prove satisfactory on further trial. There has been little demand for seed from small planters. The lime cultivation generally shows great improvement, presumably as the result of last season's rain.

Mr. Robson was away during the middle of March attending the Cotton Conference in St. Kitts. Work in connexion with the Montserrat Onion Growers' Association is stated to be proceeding smoothly; 380 crates and 60 barrels of onions have been shipped, and a further number of 112 crates were ready to go to Barbados at the time of writing. The large total of 370 lb. of onion seed has been ordered for next season's planting. The rainfall at Grove Station during March was 3·68 inches.

ANTIGUA. In his observations on matters of agricultural interest for March, Mr. T. Jackson, the Curator, states that the stand of young canes is not as good as that of last year; the crop now being reaped however, is quite satisfactory. Work at the Experiment Station has consisted in supplying the various cane variety experimental plots situated on different estates.

A very successful Maize Show and 'At Home' of the Agricultural Society was held during the month. There were 105 exhibits sent in, and approximately 200 people attended the 'At Home'. As regards the Onion Growers' Association, the number of crates of onions shipped for the month was 3,432, and for the season 4,505. The Superintendent of Agriculture for the Leeward Islands and Mr. Jackson were absent one week from the island attending the Cotton Conference in St. Kitts.

Good weather for the reaping of the cane crop continues. Departmental work of importance contemplated is the reaping of the variety and manurial experiment plots.

ST. KITTS. Mr. F. R. Shepherd states that the following were distributed from the Experiment Station during March: yams, 948 lb., eddoes 100lb., selected cotton seed 1,438lb., white velvet beans 421 lb. and 300 cane cuttings.

As regards the staple crops, the reaping of the cane crop is rapidly progressing. The Basseterre factory is working at high pressure, and the returns are excellent. The yield per acre on the estates is in harmony with the estimate made, and one estate has reaped an average of 29·5 tons of cane per acre from plants and ratoons. The young cane crop is growing rapidly, and the plants are strong and healthy. As regards cotton, on one estate in the northern district about 20 acres has already been planted. There is every prospect of an increase in the acreage planted this season. A considerable amount of the time of the Agricultural Superintendent this month was spent in making arrangements in connexion with the Cotton Conference held in this island.

The reaping of the sugar-cane experiments has begun and large returns are reported from Buckleys estate, where four of the varieties averaged over 60 tons of cane per acre, and the average of eighteen varieties was 50 tons. By an oversight in the issue of the *Agricultural News* for February 26, we stated in these notes that Mr. F R. Shepherd had been elected President of the Agricultural Society. Mr. E. J. Shelford was the gentleman elected.

The rainfall for the month of March at the Botanic Gardens was 3·31 inches.

VIRGIN ISLANDS. In his notes on items of local interest during February, Mr. W. Fishlock states that cotton continues to come in. It is estimated that the total crop for the year will be about 105 bales of 200 lb. each. Onions have also begun to come in. The crop is estimated at about 150 crates of 50lb. each. The Curator visited Virgin Gorda in the early days of the month. The total fall of rain for February at the Station was 2·89 inches.

EXPORTS OF SEA ISLAND COTTON FROM THE WEST INDIES.

The following table gives the quantity and estimated value of Sea Island cotton exported from the West Indies to Manchester for the quarter ended December 31, 1915:—

Colony.	Quantity, lb.	Estimated value, £.
Barbados	7,529	502
St. Vincent	31,976	2,132
Montserrat	3,912	243
Antigua	15,500	969
St. Kitts	8,260	516
Nevis	9,606	600
Anguilla	7,250	453
Virgin Islands	4,427	258
Jamaica	8,700	326
	97,160	5,999

SEA ISLAND COTTON MARKET.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 18, 1916, is as follows:—

ISLANDS. There sprung up a demand the early part of the week for the entire offerings of Fine to Fully Fine at 29c. to 30c., resulting in sales of about 150 bales, the buying being on account of the Southern and Northern Mills.

There is now left unsold of this crop only 60 bales. Fully Fine to Extra Fine held at 31c. and one crop lot of Extra Fine 32 bales held at 33c.

We quote, viz.:

Extra Fine	30c. = 19½*d.* to 20*d.*	c.i.f. & 5 per cent.
Fully Fine	29c. = 19*d.*	" " " "
Fine	28c. = 18½*d.*	" " " "
Fine off in class	27c. = 18*d.*	" " " "

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester up to March 11, were 658 and 443 bales, respectively.

COTTON CONFERENCE.

SECOND DAY'S PROCEEDINGS.

In the last issue of the *Agricultural News* was published a summary of the proceedings of the first day of the Conference. The principal subject on which statements were made, concerned the yield of lint per acre in the different islands. On the second day this matter was discussed in detail with a view to determining the causes of the fluctuations.

At the request of the President, Dr. H. A. Tempany dealt with a set of figures which had been compiled, showing the yield of lint per acre in the different islands from 1903-4 to 1915-16. Dr Tempany pointed out that the highest mean for the fifteen years' period as a whole was shown by St. Kitts with 149 lb. lint per acre, followed by Montserrat 144 lb., then by Antigua 121 lb., and Nevis 95 lb. Dealing with the individual instances it was pointed out that the figures tended to indicate that the position in St. Kitts was, on the whole, the most stable. In Nevis greater fluctuation was shown, which was put down to the fact that the larger part of the cotton in this island is grown by peasants. Wherever a peasant industry exists there are bound to be fluctuations. Dr Tempany called special attention to the year 1910-11 during which, throughout the West Indies, the highest average returns were obtained. The exact reason for this could not be stated, but it was thought to be due to the favourable climatic conditions of that year. In relation to fluctuation of yield, it was pointed out that the larger the total area cultivated the greater the tendency for a smaller yield owing to the inclusion of unfavourable lands. Dr. Tempany concluded his remarks with an outline of the fluctuations in Antigua in the area under cultivation and yield per acre, during the past ten years. During this period increased area was not always associated with decreased yield. The flower-bud maggot was referred to as a factor that had caused reduction in yield per acre at certain periods.

The Hon. J. S. Hollings (Nevis) questioned the accuracy of the first two or three years of the Nevis records and expressed the opinion that the average yield had been higher, On his own estates during that period large returns had been obtained. The Hon. R. L. Warneford (Antigua) pointed out that on his estates in Antigua, the yield during those years had been much greater than the average tabulated on the board before them, but he thought that on other estates small yields had been obtained which had brought down the average. This had no doubt occurred also in the case of Nevis. In replying to Mr. Hollings' remarks Mr. Shepherd (St. Kitts) agreed with Mr. Warneford's explanation. He understood it to be the case that in every island there were districts in which cotton was grown that were less suitable than others, and these included in the returns, caused the average to go down. Mr. J. O Maloney (Nevis) thought that the reason why some of the averages were rather low was because the peasants in sending in their returns of cotton per acre put down the acreage under cultivation at a higher figure than it really was. This would have the effect of bringing down the average.

Mr. W Robson (Montserrat) then gave his views on the causes of fluctuation in yields in that island. He attributed it largely to the distribution of rainfall during the four months from the date of planting; if that was unfavourable, small yields resulted. He was also of opinion that high winds in the early parts of the season had a serious effect upon growth. This reference to shelter led Mr. J. R. Yearwood (St Kitts) to refer to attempts he had made to establish wind-breaks of Guinea corn when growing cotton on the wind-ward side of St. Kitts He considered it a useful wind-break, but thought that it ought to be planted before the cotton.

The Hon. J. S. Hollings (Nevis) said that he had noticed that the north wind seemed to have a particularly deleterious effect on cotton.

Dr H. A. Tempany introduced another point into consideration, namely, the influence of soil type upon yield. Where cotton is grown on heavy soils, the factor of excessive rainfall had an injurious effect upon yield.

The President in connexion with this point asked Mr. S. C. Harland (St. Vincent) to make a statement in regard to yields of lint in that Colony. In regard to the table of figures referred to at the beginning of the discussion, Mr. Harland called attention to the general break that occurs at 1910-11. Since that year, in St Vincent at any rate, the yields had become gradually reduced. As regards the causes for this, Mr. Harland mentioned rainfall and its distribution, the effect of bad cultivation, the effect of wind, the effect of inadequate rotation of crops, and also the fact that seed is often planted on land in an improperly prepared condition. Mr. Harland made special reference to the value of wind-breaks, mentioning in particular the observed usefulness of seaside grape. In connexion with the subject of wind-breaks, Mr. S. W. Howes (Montserrat) stated that he had employed manchineel as a wind-break with great success, this tree not being for obvious reasons, interfered with by stock and by people, as white cadar is likely to be. Mr. Howes gave details as to the method of planting this tree. Mr. F R. Shepherd (St. Kitts) then referred to wind-breaks, established by Mr Thurston on Canada estate in St. Kitts. Mr. Hollings at this point drew attention to the variation in efficiency of wind-breaks. The President enquired whether any attempt had been made to plant terraced wind breaks on mountain slopes Mr. Thurston (St. Kitts) stated that he had difficulty in getting wind-breaks to grow on sloping land in which positions the wind-breaks are also injured by wind The trees grow well on flat land, but here they were not so urgently needed. Mr Thurston had obtained satisfactory results with Guinea corn and with manchineel, but stated that this latter plant does not grow well any distance from the seashore.

Mr. Harland called attention to the necessity of protecting wind-breaks in exposed situations until they had been fairly established. Mr. Robson (Montserrat) stated that white cedar had been successfully used on exposed windward estates, though it was difficult to establish a wind-break on land which had rapid slope to the sea.

Developing Mr. Harland's point, Mr. W. Nowell (Imperial Department of Agriculture) pointed out the necessity for some earlier nurse plant for the wind-break Mr. Nowell then reverted to a principal point of discussion, the question of yield of lint in relation to the cotton plant One of the most valuable points which had arisen out of the discussion was that in the last thirteen years since the cultivation of cotton had been re-established, there had been no indication of any deterioration in the quality of the seed. There had been fluctuations, but that had not been due to the plant, but entirely to conditions of environment, particularly climatic conditions Mr. Nowell then criticised figures in the table already referred to, and stated that while they might be useful to planters they had no value as an index of the cotton plant. This was explained on the basis of what

we understand by yield. On many estates where the actual amount of lint reaped has been small, the cotton plants themselves have made every effort to produce, but the actual securing of the lint has been interfered with by external conditions. The cotton plant is extremely susceptible to external conditions, and the only way of satisfactorily judging the yielding capacity of the cotton plant is by the number of flowers that are produced, each flower being a potential boll of lint.

In summing up the discussion, the President stated that it had been made quite clear that there was nothing in the nature of the deterioration of the cotton plant as a whole to account for the fluctuations in yield of lint per acre, or that these were due to the general increasing effect of pests and diseases The point that had been made clear by the discussion was, that these fluctuations in yield were largely due to fluctuations in climate: connected with this is the fact that bad climatic conditions frequently accentuate the attacks of pests and diseases. However, climate might be controlled particulary by the use of wind-breaks, the object being not merely to resist the force of the wind but to increase the humidity of the atmosphere. The President called attention to the need of more detailed climatic observations in connexion with the cultivation of cotton, and felt sure that the collection of statistics of this kind would explain a large number of fluctuations.

The discussion then turned to the steps that have been taken in each island to maintain and improve the quality of the cotton produced

At the request of the President, Mr. F R. Shepherd (St. Kitts) read a statement as to what had been done in this direction in that island Seed selection of cotton was started in St. Kitts in 1904, and this had been continued with the result that at the present time there were eight numbers representing types of pedigree strain. All these were selected in the field from the original Rivers' seed with the exception of No. 342 S., which was selected from seed imported from Barbados in 1906 and known as Stirling, itself a derivative of Rivers's seed.

Until about two years ago the method of selection adopted in St. Kitts was not strictly the progeny row system. That is to say, in each plot of the eight strain seed was taken from more than one plant for future use. About two years ago this system of selecting from three or four plants was discontinued, and seed was taken from one plant in each plot only. This seed gave what is known as the progeny row, and this progeny row the next year supplied a plot from which seed was obtained for estate planting.

Mr Shepherd drew attention to the purity and high quality of No 342 S. for planting in the coming season there would be a stock of about 2,000 lb. of seed.

In regard to the position in Antigua, Mr T Jackson and Dr H. A. Tempany made several statements. Supplementing these with information contained in the Botanic Station Reports of that island, it would seem that in the early days of the industry seed was selected *en masse* from the best fields on different estates. This seed was picked over by hand and the clean non-tufted seeds were discarded. In 1911 it appears that experiments with selected individual plants were started at Skerretts. This work was later transferred to Yetpons estate where the soil conditions are more suitable for cotton. Yeptons has in recent years become the cotton 'seed farm' for a large portion of the island Apparently a type, recorded as No. 7/1912 planted at Yeptons gave rise to type No 312 of 1914, of which one plot was planted in 1915 and 2 acres of the same in 1916. This seed is available for planting the crop of 1917. Thus in the last two or three years the progeny row system has been in operation in Antigua.

Mr. W. Robson (Montserrat) then read a statement as to methods adopted to maintain and improve the quality of cotton in that island. For many years past the type of cotton that had been largely grown and placed in the hands of the planters by Mr. Robson was what is known as Heaton 9, which could be traced back to an original individual plant. Mr. Robson is now examining and selecting with a view to producing an improved type. Mr. Robson included in his statement various points concerning methods of selection, an account of which may be deferred until later. One interesting statement made by Mr. Robson was to the effect that in a valuation of two types of cotton grown last season, namely some from Heaton 9 and some arising from a St. Kitts type of seed, the latter was more highly valued by the brokers than Heaton 9.

The President then requested Mr. Harland (St. Vincent) to make a statement regarding methods of seed selection in that island. Mr. Harland said that the Sea Island cotton industry of St. Vincent was started on a commercial scale in 1904 with the planting of the Rivers' type only. This, on account of the appearance of a large uumber of 'rogues' in the field was recognized as not being a pure strain. It was considered necessary to devise some means of maintaining the quality of the cotton, with the result that a mechanical method of seed selection was adopted. This had relation principally to the discarding of clean non-tufted seed This method, though an imperfect one from a breeder's standpoint, was successful in its practical results up to 1914.

Reference was then made by Mr. Harland to the St. Vincent superfine cotton known as BH. This seed had been sent out to planters in St. Vincent from Manchester, and represented a special type of its own quite distinct from the Rivers' or ordinary St. Vincent Sea Island cotton.

Long before 1914 the attention of planters had been called to the progeny row system of selection, and although this was adopted on some estates, there was no continuity of effort. In 1910-11 the local types were selected and grown in plots at the Experiment Station. In the selection of these types attention was principally directed to resistance to disease, but the securing of a pure strain in this connexion has not yet been realized.

At the Botanic Station, however, in 1910, an interesting plant was discovered in a plot of BH cotton having the habit of the one-stalk cotton as defined by O. F. Cooke, of the United States Department of Agriculture. It is believed to be a pure strain, and appears to be resistant to disease, and early maturing. Seed from this original plant was obtained by the progeny row system, and recently two trials of this cotton have been made on estates in wet districts, and the yield of seed-cotton has been far higher than that obtained from other types of cotton under similar circumstances.

Another individual plant selection has had regard to a type which has been specially selected for disease resistance and lint characters This has been very favourably reported on by the brokers as superior to the ordinary St. Vincent, and a considerable quantity of seed is now available for planting purposes on estates. For practical purposes, this may be regarded as a superfine type.

This account of the second day's proceedings will be continued in the next issue of the *Agricultural News*.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

Imperial Commissioner of Agriculture for the West Indies — Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the necessity for a system of education which will engender a scientific habit of mind amongst individuals in every community.

On pages 134 and 135 will be found an account of part of the second day's proceedings at the West Indian Cotton Conference recently held in St. Kitts. The account will be continued in the next issue of this Journal.

Some interesting items of news will be found under the caption Down the Islands on page 132.

Insect Notes in this issue contains an article dealing with the sugar cane borer and its control by means of parasites and poisons. An article on slugs will also be found on the same page.

The Ajowan Plant in the West Indies.

During April 1915, a quantity of seed of *Carum copticum*, the Ajowan plant, from which thymol is obtained, was received from the Royal Botanic Gardens, Kew, and distributed to the different islands of the Windward and Leeward groups. The plant in question is grown principally in India, and as a cold weather crop. Observations concerning its power to grow in the West Indies are therefore of considerable botanical, as well as of economic interest.

A letter has recently been received from the Agricultural Superintendent, St. Kitts, to the effect that the seed germinated well at the Experiment Station, many plants being raised. They grow to a height of about 2 feet, and seed is being collected for further trials. The plants were much beaten down by heavy rains, however, and it would appear that drier situations might yield more satisfactory results. As noted in the *Agricultural News*, No. 355 of 1915, a similar report to that from St. Kitts was received from St. Lucia. The plant is also known to have developed satisfactorily in Montserrat, and if the damage inflicted by heavy rains could be avoided, there seems to be no reason, especially after acclimatization, why this plant could not be grown on a commercial scale in the West Indies, provided there was sufficient economic inducement to do so.

The New School of Tropical Agriculture, Ceylon.

The opening of the School of Tropical Agriculture in Ceylon in January this year is referred to again in a recent issue of *The Tropical Agriculturist*. This institution is in proximity to the famous Botanic Gardens at Peradeniya, and has been inaugurated in an economical way, no excessive outlay having been incurred on buildings and equipment, while the expenditure connected with providing a teaching staff will be met to some extent by tuition fees of the students.

Although some years must necessarily elapse before the effect of the school is clearly felt and understood in the agricultural welfare of Ceylon, it is reasonable to believe that this effect will be cumulative.

The providing of some elementary scientific training for young men who intend to devote themselves to agriculture is only a part of the objects of the School. The teachers of the Government vernacular schools are to take the course in order to qualify them for teaching agriculture. The number of these teachers will probably be increased annually, till all who pass the Training College will be sent to Peradeniya, before being appointed to village schools. Boys in the country will therefore be taught something about the land and its products by teachers possessing some knowledge of the subject themselves. In this way, too, the functions and benefits of the Department of Agriculture will become familiarized to the minds of the people, enabling the Department to get into close touch with both the planter and village cultivator, and their needs.

The Enfleurage System of Scent Extraction.

The volatile compounds which give to flowers their odour may be extracted by the ordinary distillation process or by what is known as the 'enfleurage' system. This is concisely described in the *Perfumery Record Year-book and Diary*, 1916. Some flowers, it appears, like jasmine, roses, tuberose and violets behave somewhat refractorily under the distillation process, so the idea arose of placing the blossoms in contact with fat, which, especially in a melted or semi-melted condition has the property of absorbing the floral odour. Lard and beef fat being the most neutral were employed in preference to other forms of grease, but it may be supposed that in recent times vegetable fats like cacao butter and palm oil have largely taken the place of the more expensive animal products. The most up-to-date method is to use sheets of glass in wooden frames, to cover these with a coating of fat, and sprinkle the flowers on them and then stack the sheets one upon the other and leave them thus for, say, about fifteen hours. The scent is afterwards dissolved out with alcohol.

The Yearbook referred to, from which the above imformation has been obtained, is in many respects a valuable publication. It contains, for instance, a review, by the editor (Mr. J. C. Umney, F.C.S.) of the work on essential oils published in the *Perfumery and Essential Oil Record* in 1915, and is a continuation of previous summaries. Another useful section deals with the analysis of essential oils, and gives a statement of the principal tests employed. This should be useful to those concerned with the study of essential oils in the West Indies.

The price of the Yearbook is 2*s.* 6*d.*, and can be obtained from the Publishers, 8, Serle Street, London, W.C.

Trade and Agriculture of Zanzibar, 1914.

Through the courtesy of the Director of Agriculture, Zanzibar, we are in receipt of the Report on the Department of Agriculture of that Protectorate for the year 1914. Cloves and copra being the principal agricultural products, the War has had a considerable effect on the agricultural industry, especially in the early months, when freights were scarce. The general position of the plantation owners is said not to have improved since the last report (1913), and in Pemba especially, the plantations continue to deteriorate. Much yet remains to be done in organizing the clove harvest labour. It is mentioned that in the last season the Government and Arabs alike lost at least one-third of their early clove crop, and in Pemba heavy losses were incurred through the natives demanding such a price as, if paid, would have resulted in a loss to the clove grower, and returning to their villages when their demands were not met. Notwithstanding these difficulties the Government benefited by an exceptionally heavy crop, and the plantation owners also benefited proportionately. The northern plantations, however, suffering as they have done from a number of lean years, show their want of funds for cultivation by their condition.

Regarding copra, this industry has been affected by the War to a greater extent than that of the cloves. The quality of Zanzibar copra shows no improvement, and for the purposes of price comparison—it not being quoted separately in the market list—may be taken as equal to 'South Sea Islands'. To effect any great improvement in the price obtainable for Zanzibar copra, an article must be turned out that will produce an edible fat. Such, at least, is the conclusion arrived at by the Director of Agriculture.

In a table giving the export of Chillies and Gum-copal for the past ten years, 1905-14, it is seen that the average export of Chillies has been maintained, while that of Gum-copal suddenly declined in 1914 by more than £60,000. It is explained, however, that the Gum-copal exported from Zanzibar now is of outside origin, and comes principally from German East Africa.

Teachers' Salaries.

In his opening address to the Legislative Council of St. Vincent, the Administrator requested the members to approve a general increase in the salaries of teachers in the primary schools, a matter which His Honour regarded an act of justice no less than one of sound policy. In a letter addressed to the Chairman of the Committee appointed by the Government, His Honour referred in strong terms to this question of underpayment. He pointed out that a memorial had been received from the Teachers' Association and, in particular, a letter from the Head teacher of the Bequia Anglican School, representing that his salary, which is at the rate of $12 a month, was insufficient. His Honour called the Committee's attention to the fact that the lowest paid appointment in the regular Government Service is that of a fifth clerk with salary at the rate of £42 per annum, 40 per cent. more than that of the teacher referred to.

His Honour stated that he considered there must be something radically wrong with a system under which 39c. a day, not quite double the pay of an unskilled road labourer, is considered proper remuneration for the services of a teacher responsible single handed for the daily instruction of a school of over 200 pupils. As regards the general question, His Honour's view was that education is better worth spending money on than any other object which calls for the expenditure of public funds. It is in the highest degree short-sighted and impolitic to run the teaching staff on the cheap. Their work is the hardest, most responsible, most troublesome and worst paid that any body of servants have to perform. Good teachers cannot be looked for at starvation wages, and unless it is made worth their while to teach they will go where their services are more fairly recompensed.

INSECT NOTES.

FIGHTING THE SUGAR-CANE BORER WITH PARASITES AND POISONS.

In the *Louisiana Planter* for December 18, 1915, an article appeared under the heading given above, in which methods were discussed for the control of the moth borer of the sugar-cane (*Diatraea saccharalis*). The article referred to was by Mr. T. E. Holloway, in charge of Sugar-cane Investigations, Bureau of Entomology, U. S. Department of Agriculture.

The moth borer of sugar-cane has been known as a pest in Louisiana for many years. Until recently the trash in cane fields was burned, but now it is coming to be recognized that the non-burning of trash may have some influence on the abundance of the egg parasite of the moth borer (*Trichogramma pretiosa*), and planters are being advised to make trials on a limited scale of saving the trash and ploughing it under in the Spring. In the experiments carried out in the 1914-15 season, however, it was found, by careful counts made to determine the relative abundance of the parasite in burned and unburned fields, that there was no difference, and that the results of the experiment were negative. This was believed to be due to the long period of dry weather which was experienced, the drought lasting from sixty to 120 days in different places. It is mentioned that Walcott* found that the amount of rainfall exercised a direct influence on the abundance of moth borer in sugar-cane fields in Porto Rico; the greater the rainfall the less severe were the attacks of the moth borer, and the less the rainfall the greater the attacks of this insect. The question is raised as to whether it may not be that dry weather is unfavourable to the parasite, *Trichogramma pretiosa*.

As a result of an expedition to Cuba in search of other parasites of the moth borer, species of Tachinid flies, *Tachinophyto*, were collected and sent to the Experiment Station at Audubon Park.

These flies are parasitic on the Diatraea larvae, and they have been found to breed in Louisiana. It now remains to be seen whether they are capable of enduring the winter in Louisiana, which is severe in comparison with the climatic conditions in Cuba.

In addition to a discussion of parasites, the article refers to the use of stomach poisons on cane plants as a means of control of the moth borer.

It is well known that the Diatraea female deposits eggs in clusters on the leaves of the cane plant, and that when the caterpillars issue from the eggs they feed at first on the leaf tissue before boring into the heart of the plant

It is stated that very good results have been obtained by dusting arsenate of lead on the cane plants from a cloth bag in the same way as cotton is dusted for the control of the cotton worm. Two applications of arsenate of lead were made on young cane plants which gave very good results in the decreased numbers of the dead hearts.

The lines of work discussed are summarized under three heads: (1) non-burning of cane trash, (2) the introduction of new parasites from Cuba, and (3) the application of powdered arsenate of lead to kill newly hatched larvae and prevent the occurrence of dead hearts.

*Geo. N. Walcott. The Influence of Rainfall and the non-burning of trash on the abundance of *Diatraea saccharalis*. Circular No. 7, Board of Commissioners of Agriculture, Porto Rico.

SLUGS.

Recently there have been rather frequent references in the different islands of the Lesser Antilles to the abundance and destructiveness of the Slug or Palut (*Veronicella occidentalis*). A statement now comes from a planter in Antigua that this slug has disappeared from a certain locality in that island; he also says that the craupaud eats the slugs. The slug, or palut, as it is generally called, is an air-breathing mollusc without a shell, the body being covered by a coriaceous mantle. The length of this slug often reaches and sometimes exceeds $1\frac{1}{2}$ inches.

The palut is widely distributed in the West Indies and has at times caused damage to a variety of plants. It is recorded from Antigua, Montserrat, Dominica, St. Lucia, St. Vincent, and Barbados.

Very little seems to be known about the habits and food plants of this slug. The following notes are presented in order that planters and agricultural officers may know what is recorded, and be encouraged to add to the known facts by submitting their observations.

In Montserrat the slug appeared in great numbers at the Botanic Station in 1914, where they destroyed germinating ground nuts which were planted in a plot from which sweet potatoes had been harvested a short time before.

Hand collecting was tried on this plot, which was $\frac{1}{4}$-acre in area, with the result that the following numbers were collected on five consecutive days, May 26-30, 1914: 2,800 2,000, 1,000, 1,654, and 1,360. This gives a total of 8,814 slugs collected in five days on $\frac{1}{4}$-acre.

It has been troublesome in the mountain lands, where it attacks the potatoes and other crops in the peasants' provision grounds.

In St. Lucia, a few years ago the garden plots at the Experiment Station at Union were badly infested by slugs, cassava, cabbage, beans and other garden produce being almost completely destroyed. If the slugs had been collected here, probably the numbers would have been fully as large as in the Montserrat results given above.

In Montserrat, during the dry season a few years ago, forty-eight slugs were found at the base of a lime tree, twenty-five being closely packed together in one mass.

In St. Vincent, ground nuts have recently (1915) been severely attacked by this slug, especially in the fields bordered by wild land. The slugs appear to come into the cultivations from the bush or pasture, and they destroy the ground nuts in strips of varying width along the borders of the fields.

Sweet potatoes appear to be most attacked when the slips are first planted out.

Ferns and other plants in the ferneries and plant houses are sometimes severely attacked.

No records of satisfactory remedies seem to be available: Hand collecting has been tried as noted above. This is done by the use of a skewer or long, pointed iron rod, the slug being impaled; and when a certain number have been collected on the rod, they are slipped off into a suitable receptable

Their habit of feeding does not appear to have been carefully observed. If they feed on the foliage of plants, they might be killed by means of the ordinary poisons sprayed or dusted on.

After a crop is harvested the ground might be thoroughly cleared of weeds and all plant growth, and the slugs trapped by providing suitable hiding places such as old bags and boards on the surface of the ground or heaps of trash which would afford protection from light and heat. The examination of these traps from day to day would result in the capture of large numbers of the slugs.

Experiments should be carried out in the use of poison baits of various sorts.

If these slugs can develop to a point when they occur at the rate of more than 35,000 per acre, they may easily become very seriously destructive, and it is worth while for everyone concerned to acquire as much knowledge of the pest and its habits as possible.

H.A.B.

COMPOSITION OF DOMINICA MILK.

The following report by Mr. G. A. Jones, Assistant Curator and Chemist, Dominica, on the composition of the milk sold in the principal town, Roseau is of interest.

During the week ending March 4, twelve samples of milk were analysed in the local laboratory; the samples were obtained under the direction of the Chairman of the Roseau Town Board, and represented a portion of the milk sold by twelve different licensed milk sellers in the town

The results of the analysis are given in the table which follows:—

No. of sample.	Total solids.	Fat.	Solids not fat.	Water.	Specific gravity.
1	11·73	2·5	9·23	88·27	1·0334
2	15·01	6·5	8·51	84·99	1·0257
3	12·26	4·1	8·16	87·74	1·0282
4	12·30	4·0	8·30	87·70	1·0281
5	13·64	4·7	8 94	86·36	1·0306
6	11 98	3·5	8·48	88 02	1·0288
7	12·72	4·0	8·72	87 28	1·0301
8	12·75	4·0	8·75	87·25	1·0306
9	17·17	7·7	9·47	82 83	1·0295
10	14·17	5·7	8·47	85 83	1·0287
11	13·31	4·4	8·91	86·69	1·0304
12	11·90	4·4	8·00	88·10	1·0269
Mean of 12 samples	13·24	4·6	8·66	88·75	1·0292

The legal standard for milk in

1. The United Kingdom is 3 per cent. fat, 8·5 per cent. solids not fat.

2. The United States of America is 3·25 per cent. fat, 8·5 per cent. solids not fat.

3. Jamaica is 3·5 per cent. fat, 8·25 per cent. solids not fat.

A comparison of the results of the analysis of the Roseau milk supply as represented by these samples with the above legal standards shows that a very good quality of milk is offered for sale. One sample only (No. 1) shows a deficiency in fat, even when compared with the high legal standard of Jamaica. By the same standard two samples (Nos. 3 and 12) show a deficiency in solids other than fat, and in the case of No. 12, water has been added to the extent of 3 per cent.

The mean results of the analysis of the twelve samples are well above the legal standards of the different countries enumerated above.

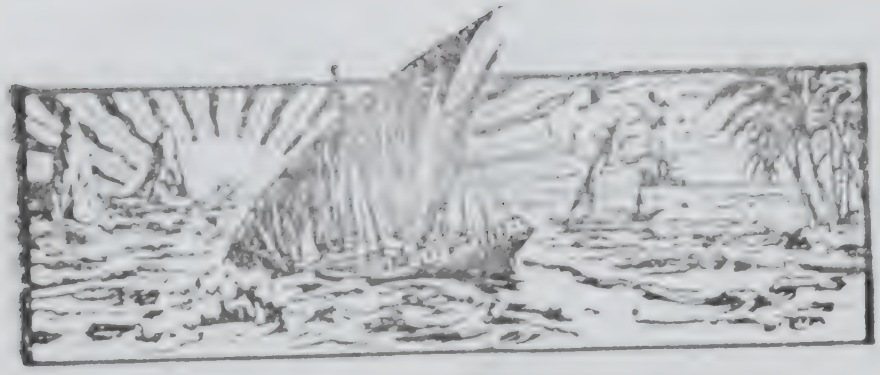
The foregoing was published in the Dominica *Official Gazette* for March 13, 1916. It bears out similar observations made in other West Indian colonies, namely, that the milk in these islands contains a high percentage of fat. In considering, however, the individual fat determinations in the above table, it must be remembered that the extreme results are probably due to imperfect sampling For the detection of water adulteration, the solids not fat is the essential determination.

A COMMONWEALTH INSTITUTE OF SCIENCE AND INDUSTRY.

A valuable report of a committee appointed in pursuance of a motion passed at a Conference convened by the Prime Minister of the Commonwealth of Australia, is published in *Nature* for March 9, 1916. The Committee included representatives of commerce and manufacture as well as of science and the Departments of State. The proposals of the Committee, which are given briefly below, have, it is understood, the approval of the Federal Government, and it is probable that a Bill will be laid before the Federal Parliament to give effect to these recommendations. The proposals are on lines somewhat similar to those of the British Government scheme for the organization and development of scientific and industrial research. It may be mentioned that agriculture was strongly represented on the Committee, three of the four ministers present being State ministers of agriculture.

The principal recommendations are as follows. It is recommended that there should be established under Act of Parliament a Commonwealth Institute of Science and Industry (including agriculture). The principal functions of the Institute should be: to initiate scientific researches; to collect industrial scientific information; to establish national laboratories; to establish industrial research fellowships; to direct attection to possible new industries; to keep in close touch with Government departments, professional societies and private enterprises concerned with scientific industrial research, in order to prevent undesirable overlapping of effort. The Committee emphasize strongly the undesirability of combining scientific research and the laboratory work of the testing departments. Any attempt to combine research and routine of this nature would tend to weaken both branches of activity. It is recommended that the Institute should be controlled by three salaried Directors appointed by the Governor-General in Council, and one should be an expert business and financial man, and two should be chosen mainly on account of scientific attainments and wide experience. It was further resolved by the Committee that all discoveries, inventions, improvements and processes should be vested in trustees as its sole property, and should be made available, under proper conditions, and on payment of gratuities or otherwise for public advantage. The payment of bonuses to successful discoverers or inventors is recommended. The work of the Institute should include the co-ordination of work in technical and agricultural colleges in Australia.

The Committee suggests for the consideration of the Advisory Council, a certain set of problems which, among others, are pressing: for example, the sheep fly pest; improved methods of extracting zinc from Australian ores; the introduction of a mechanical cotton picker; the eradication of the prickly pear; the recovery of potash, manufacture of alkaloid, and condensation of sulphuric acid gas at present being wasted; the cultivation of useful indigenous grasses and salt bushes; the manufacture of chemicals, drugs and explosives.



GLEANINGS.

It is stated in the *Port-of-Spain-Gazette* of March 29, that quite recently a shipment of 1,281,001 gallons of Trinidad crude petroleum and 51,561 gallons of Trinidad oil fuel, was made to Perth Amboy. This shipment was made by the new Trinidad Lake Petroleum Company at Brighton.

It is stated in the *Bulletin of the Department of Agriculture of Trinidad and Tobago*, Vol. XV, Part 1, 1916, that the Agricultural Credit Societies Ordinance, the draft of which has already been noticed in the *Agricultural News*, has been passed as Act No. 30 of 1915. Its operation will be followed with interest.

Considerable enterprise is being shown by a producer of honey in Barbados who is advertising his produce by means of handbills. These contain some twenty-four recipes involving the use of honey in cooking. The great variety of dishes in which honey can be an ingredient is shown in these recipes, and should tend to extend the use of this article of diet in many households

An interesting paper on a method of correcting for soil irregularities in the testing of varieties in field plots appears in the *Journal of Agricultural Research*, Vol. V, No. 2. The method is based upon what is known as the contingency method of Karl Pearson. This consists in obtaining the probable yield of each plot by subtracting the 'calculated' yield from the observed yield.

According to a note in the *International Sugar Journal*, sugar added to a photographic developer produces a restraining effect similar to that of the commonly used potassium bromide. For example, the time of development of a normal metol-hydroquinone developer of 100 c.c. was increased from five seconds to five minutes by the addition of 60 grammes of sugar, without fogging the clear parts of the plate or injuring the quality of the black deposit.

In the past, the chief British scources of logwood supply have been Jamaica and British Honduras. According to the London *Chamber of Commerce Journal* for March 1916, a trial shipment was made in 1912 from Mauritius, and though at that time the prices offered were not high enough to encourage the export, there is every possibility that the higher value at present ruling will induce Mauritius to send supplies to the United Kingdom.

According to the *Gardeners' Chronicle* for March 4, 1916, the Council of the Royal Society have recommended Mr. Maiden, Director and Government Botanist, Botanic Gardens, Sydney, and Professor Pearson, Honorary Director of the recently established Botanic Gardens of the Union of South Africa, for election into the Royal Society. The journal referred to expresses satisfaction at the Royal Society showing its appreciation of Imperial scientific effort.

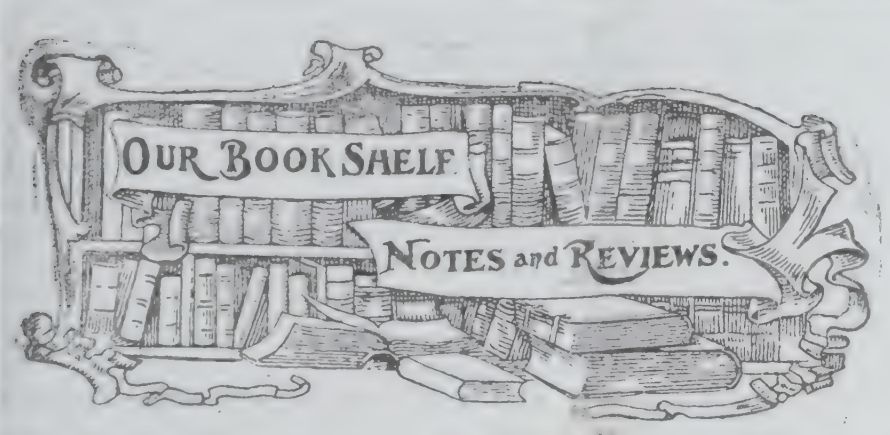
According to the Trinidad *Mirror* for April 1, limes have been included in Trinidad under the category of licensable produce. This was the result of the Attorney General's opinion that the lime industry in Trinidad is likely to develop into large proportions. A clause has been inserted which exempts small dealers in limes which are to be used for domestic purposes, somewhat on the same lines as green coco-nuts are exempted in the coco-nut industry in Trinidad.

A leaflet has been issued by the St. Lucia Agricultural Department on bay oil and bay rum as an industry capable of development in that Colony. The leaflet contains useful suggestions. In connexion with this subject, it may be interesting to point out that the value of bay tree products exported during 1914-15 have been, in the islands mentioned, as follows. Dominica £461, Montserrat £160, St. Lucia £74. A large part of the Dominica produce consisted not of oil but of leaves.

According to the *Journal of the Royal Society of Arts* for March 3, 1916, there are large deposits of potassium salts in Alsace. Should Alsace again become French, they will form an inhaustible supply of chemical fertilizers. It is estimated that the beds contain some 3 million tons of pure potash, which at present rate of consumption would supply the world's demand for potash for nearly five centuries. The most important constituent of the Alsacian deposits is silvenite, a mineral in which chloride of potassium predominates, which can be used as a fertilizer directly after pulverizatiou.

An article on exhibition onions appearing in the *Gardeners' Chronicle* for January 15, 1916, states that the best exhibition bulbs are grown with only a moderate supply of manure, but with thorough cultivation. It is stated that a sprinkling of salt and soot over the surface to be forked in, is useful at planting time. Great care should be taken when lifting not to bruise the bulbs. The loose skin should be carefully removed and the bulbs sponged over. The conditions of production differ in temperate countries somewhat from those in the tropics, but extreme care in cultivation, handling, grading and packing hold good universally.

As a record of the constitution, both chemical and mechanical, of the chief soil types in Fiji, Bulletin No. 9 of the Department of Agriculture, Fiji, is of value. The principal soils appear to be of the clayey type. These are found at the Nasinu Experiment Station, at Suva, and at Galoa. The soil at Laucala appears to be typically sandy. All the soils contain a fair percentage of potash and, in nearly every case, of phosphoric acid. The soil at Navua is of interest on account of its high nitrogen content (0·92 per cent.). This soil is of the black peaty type. The work referred to has been carried out by Mr. C. H. Wright, B.A., the Agricultural Chemist, who was formerly a member of the staff of the Trinidad Department of Agriculture.



EGYPT OF THE EGYPTIANS. By W. Lawrence Balls. Pp. 266, plates 32. London: *Sir Isaac Pitman & Sons, Ltd. 1915.* Price 6*s*.

Progressive cotton planters and most botanists are familiar with the name of Lawrence Balls in connexion with his researches on cotton and the cotton plant in Egypt. It is evident from this book that during his nine years' residence in that country, Mr. Balls's attention was by no means restricted, as one might almost have thought from the volume of work performed, to specialized observations in connexion with his professional studies. In this book Mr. Balls appears as a descriptive writer of considerable artistic instinct, displaying also a sense of humour and of just proportion—qualities which the general public do not always associate with the scientific specialist.

Part I of the book sketches the history of Egypt from 4241 B.C. until to-day—a matter of sixty centuries. Obviously space limitations render the most general treatment necessary, but it is none the less useful on that account, considering the majority of people are ignorant of the subject.

Part II deals with the Nile. In Egypt the Nile is synonymous with prosperity. The marvellous irrigation system that has been evolved, which culminated in the raising of the Assuan Dam in 1913, supplies water by canal and ditch to every cultivated field in the country.

The total area of land in Egypt capable of using perennial irrigation is about 7,000,000 acres. In order to grow a crop every summer on this entire area, the Nile discharge during the summer months would have to be augmented by 6,000,000,000 tons of water. This has been partly accomplished by the raised Assuan Dam, which holds up water to the extent of 2,300,000,000 tons of water over and above the normal content of the river bed. Although this does not meet the requirements of the whole of the cultivable land in Egypt, yet under the existing régime the crops grown can be safely carried through even with the smallest or latest Nile flood imaginable.

Part III of the book concerns the inhabitants of Egypt chiefly in relation to industry. This section displays on intimate knowledge of the native peasant or fellah, and includes some interesting observations regarding the 'foreigner' in Egypt. As regards modes and methods of travel, the Egyptian railways are amongst the most comfortable and efficient in the world, at least the main lines are. As in many other parts of the world, motor bicycles and dust are pestilential on the roads. In the case of the former, however, when ridden along canal banks, the danger run by the driver is described as being greater than that confronting the pedestrian.

One chapter of this part of the book which should certainly be referred to in some detail before concluding this review, is that containing an account of the cotton industry in Egypt, because this is a matter of direct interest to the West Indian planter. Cotton is a very old-established crop in Egypt, but not in its present form. Originally a tree cotton was grown, but about 1800 better quality types were introduced from America. The great impetus to cotton-growing in Egypt was given by the American Civil War which practically caused a cessation of the world's supply. In 1861 when the American Civil War broke out, Egypt's crop was 596,000 kantars; in 1865 it was 2,140,000 kantars. The largest crop yet obtained is 7,684,000 kantars. Possibly the crop of Egypt will never be greater than 15,000,000 kantars owing to the limited area of land available. It is important to remember that the growing of cotton is not a gamble in Egypt as it is in some parts of the world, owing to her wonderful irrigation and climate.

Another point to bear in mind is that the question of seed supply has for many years received expert attention, so that Egypt now produces some of the finest cotton in the world and may, some day, actually compete with the fine Sea Island of the West Indies. As regards the commercial side of the Egyptian cotton industry, Mr. Balls has for it nothing but praise. Buying, ginning and inspection of the crop are all centred in a few large commercial houses. The ginning is described as remarkably efficient, being conducted at the rate of 120 lb. of lint per hour. The grading of Egyptian cotton is also very efficiently done, the result of a combination of instinct and observation.

Mr. Balls expects the yield of lint in the future to reach 550 lb. per acre instead of the present 450 lb. In the West Indies we are content with 300 lb. but, of course, West Indian cotton fetches a higher price than Egyptian.

A NEW COVER CROP.

In the October number for 1914 of the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, reference is made to a new cover crop, *Dolichos hosei*, obtained by the Royal Botanic Gardens, Kew, from the experimental plantation, Kuala Lumpur. Through the courtesy of the Director of Agriculture of the Federated Malay States, the Commissioner of Agriculture for the West Indies was able to procure some seeds of this plant, and these were distributed some months ago for trial to the different West Indian islands. In forwarding these seeds, Mr. Lewton Brain the Director of Agriculture, Federated Malay States stated that the plant is easily propagated from cuttings. Seeds are not easy to obtain. He also stated that the plant in question grew very well in Sarawak, from which country it was introduced into the Federated Malay States.

A note has just been received from the Agricultural Superintendent, St. Lucia (Mr. A. J. Brooks), concerning the result of a trial made with this plant in that island. He states that the plant should be a great acquisition where a close cover crop is desired. Dealing with the growth of the plant itself, Mr. Brooks states that of the seeds received only one germinated; this grew strongly, and after being planted out, completely covered an area of soil 31 feet by 21 feet with a dense covering of green foliage, in five months. Although the plant may be easily propagated by cuttings, the method adopted by Mr. Brooks at Réunion Experiment Station is to cut it up into small squares like grass turf and plant it where it is desired that it should spread.

PLANT DISEASES.

LATER EXPERIENCE WITH THE CITRUS CANKER IN FLORIDA.

Articles have already appeared in the *Agricultural News* dealing with the first recognition of citrus canker in Florida, and with the drastic measures, culminating in the burning up of infested groves with flaming sprays, taken in the attemp to stamp out the disease. The discovery of its cause, a bacterium, by Miss Clara Hasse, of the Bureau of Plant Industry, has also been recorded.

Bulletin 128 of the Florida Experiment Station, published November 1915, entitled 'Citrus Canker III,' by H. E. Stevens, gives some very interesting further information as to the nature of the disease and its present position in Florida.

The author remarks that there are certain peculiar features of the disease that are not easily explained. Canker seems to be capable of remaining dormant on a tree, or quiescent in its vicinity, for long periods without any symptoms of the disease appearing; but eventually such trees may develop typical cases of canker. This has been illustrated on a number of occasions when trees have been removed to new localities from nurseries infected with the disease. These trees had been defoliated, and they showed no signs of the disease at the time of removal. To all appearance they were healthy and free from canker, although they had been exposed to the disease. Shipments of such trees were made to different parts of the State. A year later some of them had developed virulent cases of canker. Thus any tree that has been exposed to the disease may possibly develop canker at some future date. The same holds true where the disease appears in the groves. All healthy trees surrounding the centre of infection must be kept under constant observation for future outbreaks.

A map illustrating the bulletin shows that the places in which infection has occurred are scattered widely over the whole State. The author states that no canker-infected trees really exist in any of the localities indicated, for all infected trees are burned on discovery. In most cases the entire grove is burned if the trees are small. All properties where infection has been found are quarantined and kept under observation until they are considered free from disease. The quarantine area is included by a circle with a radius of a mile from the infected area.

The disease remains most serious in its effect on grape-fruit, but almost any of the varieties of citrus may be severely attacked when the conditions are favourable. Young growth is most readily attacked, but tissue of any age may become infected. Canker has been observed to develop in the bark of grape-fruit branches two or three years old. On the leaves infections first appear as small watery dots with raised convex surfaces. These dots are usually of a darker green than the surrounding tissues. Sometimes, however, the surface of the spots is broken as soon as they appear. Spots may appear on either surface of the leaf, but they do not at first penetrate through the leaf tissue. They gradually increase in size, change to a light brown and become visible on both sides of the leaf. In the older spots one or both surfaces may be bulged or raised, and such spots are commonly surrounded by a narrow yellowish band or zone. In the more advanced stages the surface of the spots becomes white or greyish and finally ruptures, exposing a light brown spongy central mass. On the fruits the spots are very similar. They project and retain a circular outline. They may be scattered or may occur together in an irregular [illegible].

The spots on young twigs are like those on the leaves and fruit; those on older twigs are more prominent and may be irregular in shape. They show the same spongy tissue, but assume a cankerous appearance and may persist for a long time.

The author adopts and confirms the conclusion of Miss Hasse that the disease is of bacterial origin. Inoculations are easily made by spraying uninjured foliage with suspensions of bacteria in water, provided that the surrounding air is maintained in a humid condition.

Results which have a very important bearing on the possibility of exterminating or controlling the disease were obtained by laboratory investigation of the organism. It was found that the bacterium is capable of remaining alive for a long time in sterilized soil, in which under favourable conditions it can multiply rapidly, and penetrate to a considerable depth. In cultures of this nature the bacteria were alive and active at the end of a period of six months. Even in air-dry soil they have been found to survive and retain their infective powers for three or four months.

The bearing of these facts upon the possibility of transporting infective material for long distances, and on the roots of plants other than citrus species, is obvious.

With a view to testing the likelihood of infection being carried on the clothing of workmen or others coming in contact with diseased trees, pieces of cloth were wetted with suspensions of bacteria from cultures. After being kept dry for five weeks the organism was found to be still alive. Dried leaves kept in the laboratory for a month were still infective.

In the groves citrus canker is spread by some carrier. Insects, birds, or animals may carry it from tree to tree. Rains and dews assist its spread within the tree. The bacteria ooze out in multitudes from the spots when they are wetted, and when dry adhere firmly to any surface to which they may be carried.

The disease spreads rapidly during rainy weather and is more or less retarded in dry periods. High temperatures and high humidity favour its rapid development.

The vigorous attempt which is being made to eradicate this very serious menace to a valuable industry will be regarded with interest and sympathy by all to whom the possibility of similar danger presents itself, but this further information as to the nature of the problem makes clear the very great difficulties involved.

W.N.

A Motor Plough for Light Work.— It is interesting to note that a new motor plough for light work on small and medium holdings, especially for shallow ploughing, or for deep ploughing in light soils, is described in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for October 1915. The machine is a comparatively small and light arrangement, and is provided with two long wooden bars which the operator uses like the handles of a plough. The motor is situated in front inside the frame. The driving wheel is a sheet iron drum fitted with a certain number of cleats with which it grips the soil. To the frame the ploughs are hitched as to the usual forecarriages of ploughs. Two small ploughs hitched to this machine did good work in a trial in Italy. The strip ploughed was 20 inches wide and 6 to 7 inches deep, on meadow land with a shallow but very hard turf and loose subsoil. The work done in ten hours was about 3½ acres, and the total cost of work did not exceed 4*s.* per acre. Completely equipped, the machine costs in normal times, about £120. The motor develops 3 to 4 h.p. The total weight of the machine with ploughs and petrol is about 840 lb.

OPENING ADDRESS TO LEGISLATIVE COUNCIL, ST. LUCIA.

A copy has been received of the Administrator's opening address at the first regular session of the Legislative Council of St. Lucia in 1916. His Honour made reference first to the war conditions which have prevailed, and expressed gratification in regard to the loyality and generosity of the inhabitants of the Colony. Notwithstanding the war and the additional expenses which it had incurred in the Colony, a deliberate policy of agricultural expansion had been followed, chiefly owing to the good prices paid for the staple products of the Colony. Reference was made to the scheme for settling persons on the land from outside the Colony or lately serving His Majesty's Forces, under easy terms. This matter has already been dealt with fully in the *Agricultural News*.

During the year a successful start had been made under the Agricultural Credit Societies Ordinance, 1915, by the formation of the first society at Dennery. His Honour pointed out that it should also be of interest to agriculturists to know that the capacity of the Government Lime Juice Factory will, in the event of the requisite machinery being obtainable, be doubled during 1916. The factory will be placed on a business footing and directed by an advisory Committee, appointed by the Adminstrator, and will no longer be conducted as a Government Department. In future the factory will be primarily reserved for the purchase and manufacture of peasants' limes, but every facility within limits of capacity will be afforded also to planters.

His Honour then referred to the falling off that had occurred in regard to the coaling trade. This had improved somewhat during the last year owing to the diversion of shipping through the blockage of the Panama Canal, and by war causes. A statement was then made as to the financial position of the Colony. The net estimated result of the year's operation, apart from war expenditure, was to add £4,595 to the surplus and deficit account making this £18,474 as against the natural surplus of £13,879 on April 1, 1915. It was proposed by His Honour that the whole of the local war expenses incurred up to March 31, 1916, should be settled on that date, and also the amount of £2,000 still owing for the cacao given to His Majesty's Forces. This would make the Colony's true surplus, therefore, £10,674. The estimates for the next financial year 1916-17, provide for an estimated revenue from local sources of £70,069, and an estimated expenditure of £67,662. In order to provide this revenue it will be necessary to continue the same additional taxation as was imposed in 1915.

His Honour then made reference to the £20,000 loan which had been subscribed locally for the improvement of roads. The work on the Castries Dennery road had been begun and was making headway. At the same time it was to be regretted that the labour supply had been curtailed owing to the many calls upon it in other directions. In connexion with this road, His Honour desired to place on record the thanks of the Government to those landowners who had generously given the necessary land free of charge, or who asked only moderate compensation for it. His Honour hoped that the assessment for the rural house tax out of which funds were to be provided for the sinking fund and interest on the road loan would be started at an early date.

The address concluded with a statement of the Special Services which the Council was invited to consider, and other matters relating to legislation. Special attention was drawn to the Export Duty Ordinance with graduated scales of duties according to market prices, and an Ordinance to regulate the use and control of motor cars.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of February:—

The general tone of the markets throughout the month of February has been fairly satisfactory. At the beginning there was a short quiet lull in the demand for many of the products that come under our notice, but business increased as the month advanced, a fair amount of trade being done at steady, and in some instances advanced, prices, such for instance, as West Indian oil of lime, nutmegs and pimento.

GINGER.

At the first auction on the 2nd of the month there were no quotations for West Indian, but 40*s.* to 41*s.* per cwt. ruled for Cochin; a week later washed Cochin was said to be fetching 43*s.*

NUTMEGS, PIMENTO, AND ARROWROOT.

Nutmegs have been in fair demand, with prices ruling slightly higher than those of last month. Pimento at the beginning of the month had slightly advanced on previous rates, and was quoted at $3\frac{3}{16}d.$ per lb., which had slightly increased at the close.

Arrowroot also showed an advance on the quotations of the previous month, the reason being the increase in freights. On the 18th about 1,000 barrels of manufacturing St. Vincent were brought forward, and sold at prices varying from $2\frac{3}{4}d.$ to $4\frac{1}{2}d.$ per lb.

SARSAPARILLA.

This drug was of very slow demand at the beginning of the month, but at auction on the 10th, large consignments were brought forward as follows: Grey Jamaica 6 bales, all of which sold, fair fetching 1*s.* 8*d.* per lb., and partly rough 1*s.* 6*d.*; native Jamaica 40 bales, 25 sold at $11\frac{1}{2}d.$ to 1*s.* for fair red, 10*d.* to 11*d.* for dull and pale red, and 7*d.* to $9\frac{1}{2}d.$ for yellow to ordinary pale red; of Lima-Jamaica 37 bales were offered and 15 sold, the bulk of which realized from 1*s.* 1*d.* to 1*s.* 4*d.* for ordinary, and 1 bale of better quality 1*s.* 7*d.* per lb. Twenty-two bales of Honduras were also offered, 10 of which found buyers at 1*s.* 6*d.* per lb. Of 16 bales of Mexican, also offered at the same time, no buyers were found.

CITRIC ACID, KOLA, CASSIA FISTULA, LIME JUICE, AND LIME OIL.

Citric acid has maintained a rising scale throughout the month. Starting in the first week at 2*s.* $10\frac{1}{2}d.$, at which rate a large amount of business was done, it rose a week later to 3*s.* with also a fair number of buyers; in the third week 3*s.* 1*d.* was easily obtained, and at the close of the month, owing, it was said, to the large number of export orders, 3*s.* 2*d.* was readily paid. Kola was represented at the auction on the 10th of the month by 36 packages, 24 of which were disposed of. Five packages of good West Indian bright dried whole nuts and halves, fetched from 6*d.* to $6\frac{1}{2}d.$ per lb., and for dry and somewhat mouldy $5\frac{1}{2}d.$ was paid; a quantity of dull mouldy Ceylon was disposed of at 5*d.* per lb. Cassia Fistula pods are reported to be very scarce, none being offered during the month There has been a steady demand for lime juice throughout the month, 3*s.* to 3*s.* 6*d.* per gallon being paid for raw West Indian. West Indian lime oil has been scarce during the month, and with small stocks on hand, 8*s.* 6*d.* per lb. is asked both for hand pressed and distilled.

MARKET REPORTS.

London.—The West India Committee Circular, March 9, 1916.

Arrowroot—2½*d*. to 4¾*d*.
Balata—Sheet, no quotations; block 2*s*. 5¾*d*.
Beeswax—No quotations.
Cacao—Trinidad, 91*s*.; Grenada, 85*s*. 6*d*. Jamaica, no quotations.
Coffee—Jamaica, 53*s*. to 57*s*.
Copra—£36 10*s*. to £37.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—£10 to £12.
Ginger—Jamaica, 75/- to 90/-.
Isinglass—No quotations.
Honey—32*s*. to 43*s*.
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £8 10*s*.
Mace—1*s*. 4*d*. to 2*s*. 6*d*.
Nutmegs—8½*d*. to 1*s*.
Pimento—3¾*d*. per lb.
Rubber—Para, fine hard, 3/2¼; fine soft, 2/11½; Castilloa, quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 24, 1916.

Cacao—Caracas, 15⅞c. to 16¼c.; Grenada, 16c. to 16⅛c.; Trinidad, 15¾c. to 16c.; Jamaica, 14¾c. to 15¾c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 55c.; Antigua and Barbados, 53c. to 55c.; St. Thomas and St. Kitts, 52c. to 54c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·55.
Limes—$5·50 to $6·00.
Mace—40c. to 48c. per lb.
Nutmegs—22c. to 29c.
Oranges—Jamaica, $1·25 to $1·75.
Pimento—4¾c. to 5c. per lb.
Sugar—Centrifugals, 96°, 5·71c.; Muscovados, 89°, 5·06c.; Molasses, 89°, 4·94c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 31 1916.

Cacao—Venezuelan, $16·25 to $16·40; Trinidad, $15·75 to $16·00.
Coco-nut Oil—$1·15 per Imperial gallon.
Coffee—Venezuelan, 10c. to 12c.
Copra—$7·00 per 100 lb.
Dhal—No quotations.
Onions—$8·00 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations

Barbados—Messrs. James A. Lyon & Co. Ltd., April 5, 1916; T. S. Garraway & Co., April 5, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$17·00 to $18·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $100·00 per ton.
Molasses—No quotations.
Onions—No quotations.
Peas, Split—$9·50 to $10·00 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·25 to $4·50 per 160 lb.
Rice—Ballam, $7·30 to 7·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·10 to $4·20.

British Guiana.—Messrs. Wieting & Richter, March 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker. & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per lb.	20c. per lb.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9c. per lb.
Dhal—	$6·75 to $7·00	$7·25
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 14c.	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·50 to $5·00	$3·25 to $3·50
Lisbon	——	——
Potatoes--Sweet, B'bados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$3·75 to $4·15	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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Method in Manurial Experiments with Trees.

IF reliable figures are wanted as to the effect of manuring, it is of the greatest importance to conduct experiments, and to interpret the results on a rational—or what is the same thing—on a scientific basis. It is impossible to arrive statistically at the truth without doing so. The only thing we can expect to learn without employing special scientific methods is the visible effects of manures. That can be done by applying manure to one part of the field or orchard, and by leaving the remainder untreated. The treated portion of the crop may, as a result, look better, and may look as if it would give increased yields. Such visible effects can generally be trusted, especially with orchard crops, and are of value. But as soon as we wish to start weighing and measuring, we encounter difficulties because it is not easy to decide when an increased yield is due wholly, or in part, to the manure applied, or to something else as, for instance, climatic changes, soil differences, or the constitution of the different plants.

It is proposed to confine attention in this article to methods employed in manurial experiments with two orchard crops—coco-nuts and cacao. The methods described are those employed at the present time in the West Indies and British Guiana. For the sake of brevity and convenience, the methods will be expressed by means of formulæ. These are quite simple expressions, although they may appear complicated at first glance.

Before proceeding to do this it will be useful, perhaps, to point out some of the features of manurial experiments with trees which differentiate them from manurial experiments with annual crops. In manurial experiments with trees the following points have to be taken into account: (1) The life of a tree is lengthy and has three periods, (a) the vegetative period, that is the period until it comes into bearing, (b) the bearing period, and (c) the period of decline during which the yield tends to fall off. We must not compare the effects of manures on trees in different periods of development. (2) The number of trees per acre is comparatively small; from this it follows that the individuality of a tree may exert a great influence. (3) Apart from ordinary individuality, there may

be intermixture of distinct varieties showing marked differences in habit and behaviour. (4) Trees often require special branch or soil treatment which introduces an unknown factor. (5) In manurial experiments with trees the effect of the manure is cumulative; the applications go on year after year to the same plants in the same soil. Each manurial plot, therefore, is to some extent its own control; its progress in itself can be measured quite irrespective of any other plot. This is an important feature, and should be appreciated by experimenters since it gives reliable information.

We may now consider methods. It doing so, it will be taken for granted that actively bearing trees are used in all the experiments, and that they are moderately uniform in every way as far as is practically possible. The question of the size and number of the plots will not be discussed since this leads to considerations somewhat outside the scope of this article. There is, however, one point which must be referred to, and that concerns the question of the value of control or untreated plots as a standard of comparison. There is reliable evidence to show that one control plot is totally inadequate in a manurial experiment with trees. As a matter of fact opinion seems to be in some quarters, that control plots are altogether valueless, as will be seen later; at any rate there can be no question that if a control is used, it is necessary to have more than one in any series of manurial trials.

Taking coco-nuts first, the method which has been in progress for three years in Trinidad may be expressed as follows:—

$$\text{Gain or loss} = \left\{ (v_1 - v_2) - (c_1 - c_2) \right\} - m$$

Where

v_1 = value of yield from manured plot
v_2 = ,, ,, ,, ,, same plot in 1911-12 (yield before manure took effect the following year, the so-called 'natural yield').
c_1 = value of the average of the two control plot yields
c_2 = value of the average of the two control plot yields in 1911-12 (natural yield)
m = cost of manuring.

This method appears to be a sound one if the 1911-12 crop can be accepted as giving the 'natural yield'. Taking the difference between the control averages is an important feature of the method, and is to be commended. These experiments show that with only one or two exceptions, manuring is accompanied by financial loss, nor does there appear to have been any physiological benefit gained by the trees.

The coco-nut experiments in Nevis have been conducted according to the plan expressed as follows:—

$$\text{Increased, or decreased yield} = \left\{ n + (n_2 - n_1) \right\} - c$$

Where

n = average number of mature nuts per tree picked between the two annual applications of manure.
n_1 = average number of manure nuts per tree at beginning of experimental year.
n_2 = average number of mature nuts per tree at end of experimental year.
c = the $n + (n_2 - n_1)$ value of control.

The financial gain or loss would be given by substituting values for yields, and by subtracting the cost of manuring.

There is only one control in these experiments, and its employment in interpreting the results is of doubtful value. The $n_2 - n_1$ operation is the notable feature of this method. n_1 is a measure of the natural productivity or yield of the tree in the first year, and of the improved productivity or otherwise in subsequent years. n is a measure of the rate of production. Each manured plot is therefore self-sufficient in itself as far as it goes. The trees in these experiments are young. Had the experiments been delayed until the trees had been in bearing for some time, it would have been possible to have determined the natural yield. Then with the controls in triplicate it would have been possible to compare the yields with the yields from the manured plots. Under those conditions the system would have been superior to that adopted in Trinidad. This, however, would have involved a delay of several years. It may be possible in the future to ascertain the natural yield of certain plots and then, later, to conduct experiments upon them.

The Nevis experiments indicate so far that considerable benefit is to be derived from the use of manures. Poorly bearing trees especially respond to manurial treatment.

Coming now to the experiments with cacao, the Dominica plan is simple and can be expressed thus:—

$$\text{Gain or loss} = (v - m) - c$$

Where

v = value of average of results in any manured plot.
m = cost of manuring.
c = value of average of results in the controls.

There is no duplication in the main or 'original' series of experiments, but they have now been conducted for fourteen years. The 'additional' series, however, started in 1907, provide extra controls and

mulched plots which enable the probable error to be calculated.

These experiments have indicated a steady gain from the application of manures, especially from mulching. Those who have followed these experiments know that a marked feature has been the decline and death of trees on the control plot. Constant supplying has been necessary. Hence the recorded control yields are really higher than they should be under strict experimental conditions of working.

In Trinidad the method adopted is similar to that used in Dominica, except that two controls have been employed. An important collateral series of observations however, have been made in Trinidad with reference to the natural yields of plots similar to those manured on the estates where the manurial stations are situated. These have shown that the difference between the yields of two untreated plots in the same year may be far greater than that between a manured plot yield and the yield of the average of the controls. For instance, at Perseverance in 1913-14, one 'natural yield' plot gave 47·28 pods per tree, while another gave only 9·30, a difference of 37·98. Now, in the experiments with manures on the same estate in the same year, the highest yielding manured plot gave 40 pods per tree, and the yield from the average of three control plots was 31, a difference of only 9 pods per tree. This is an extreme case, no doubt, but it shows how careful investigators ought to be in using their controls as standards on which to calculate monetary gain, or even increased yields. These experiments have indicated that but little benefit can be expected *with certainty* from the use of manures.

In the British Guiana experiments with cacao the yields have been expressed in the form of the minimum increase that can occur. The method can be expressed in a formula thus:—

$$\text{Minimum increase} = (v - p_1) - (c + p_2)$$

Where

v = average of results of manured plots similarly treated in the same year and repeated over five years.

p_1 = the probable error of v.

c = average of several controls repeated over five years.

p_2 = probable error of c.

This is a cautious method, and may be expected to give results that are on the safe side. Detailed figures have not been published, but the averages indicate very considerable fluctuation. Thus two of the averaged results for manured plots may or may not be higher than the averaged controls. The results obtained support in a general way those obtained in Dominica, except that quick-acting nitrogenous manures tend to cause a decreased yield in British Guiana.

The financial gain is obtained by substituting money values for yield values in the above formula.

We have now described the chief methods of experimentation that are being employed in the West Indies in manurial experiments with coco-nuts and cacao, and these have been commented on. Summing up, it would appear that great caution must be exercised in using the control results as standards. The manurial treatment of trees is a continuous process altogether different from the manurial treatment of annual crops. The behaviour of treated trees should be followed over a long period of years, and this in itself can supply valuable information quite irrespective of any control plot. The determination of natural yields before starting the experiment is very desirable, providing the trees are of an age when productivity is constant from year to year ('period b'). When enough results are available, the determination of the probable error, that is the probable limit of fluctuation, is useful for arriving at the minimum and maximum yields to be expected.

A great deal of disagreement in general results obtained is to be noticed in the West Indian experiments. It has to be admitted that the effect of manures will vary somewhat under different conditions of soil and climate, but it is thought that if there were more uniformity of methods amongst investigators there would, in all probability, be much better agreement as regards results. There has been too strong a tendency in the past to lay out manurial experiments according to personal ideas rather than according to scientific ideas. There is need for more concerted action in these matters. Until sufficiently precise methods of investigation can be devised and adopted, experimenters ought to supplement their statistics with a full verbal description of the progress and conditions of the experiment, or perhaps, what would be better, supplement their description with statistics, making the figures secondary in importance. With present methods the truth about the effects of manures on trees can be more usefully expressed in words than in numbers.

The London correspondent of the *North Queensland Register* states that the area for Queensland is 429,120,000 acres, and that the combined areas of Germany and Austria-Hungary could be placed in Queensland and leave a margin. Land is being taken up every year in thousands of acres, and Queensland must be regarded as one of the most flourishing continental tropical countries in the world.

ORCHARD CROPS.

COCO-NUT SELECTION.

Some useful selection work on coco-nuts is being conducted in Fiji, it being considered that improvement in the yielding capacity of these trees is more likely to be obtained in this way than in any other. The following consists of extracts taken from a Bulletin on the subject (No. 8), issued by the Department of Agriculture, Fiji.

SELECTION.

Sixteen palms were selected in the coco-nut blocks on Vuna estate, Taviuni, and one nut from each tree will be planted in each plot so that all the plots will be alike, as far as the origin of the seed goes. This is regarded as an important point, as it will be possible to trace whether the results of the seed from any one palm are due to local conditions or to the characters of the plant. The whole series of plots will also show to what extent coco-nuts keep true to type.

In selecting the parent trees, the aim has been to get the palms of several distinct and well-marked varieties which have been observed to be good bearers. Other well defined varieties are to be met with, but as they were not known to be good bearers, or were in some cases known to be poor bearers, they have been avoided.

A knowledge of the average results of the palms, from which the selection was made, over a series of years was essential, and on this point the advice given by Mr. H.V. Tarte, of the Vuna estate, Taviuni, was invaluable, so that there can be no doubt that the selected palms are all good bearers.

The points usually recommended for the selection of coco-nuts have been amended in accordance with suggestions of Mr. H. V. Tarte, whose observations as to the bearing powers of varieties of coco-nuts are of the greatest value.

The chief points to be considered are of course the amount of kernel in each nut, and the number of nuts borne each year. Both these characters are found to be associated with certain features more readily observed by inspection, and it is upon these 'outside' features that the selection is based.

Besides any special characters, the tree must be in a healthy condition and of vigorous appearance with deep green leaflets. The leaf-stalks may be either green or have a red colour of varying degrees of intensity, the mature nuts having the same colour as the leaf-stalks. Palms with light green leaflets should always be avoided. The age of the tree is not considered very important so long as the palm is bearing well. The plants should be taken from the general cultivation rather than from some particular spot where the conditions may be considerably more favourable than the average. The plants should have a good 'head'. Sometimes leaves are to be seen occupying only the upper half of the sphere of which the 'cabbage' is the centre, and the tips of the leaves the circumference. In other cases leaves occupy practically the whole of the sphere. In the former case the effect would be caused by the leaves dropping off at a comparatively early stage, while in the latter case they persist for a long time. Since the leaves are responsible for the work of converting the material taken up by the roots and from the air into material suitable for use by the growing parts of the plant, it is reasonable to suppose that where a tree carries a better 'head' of leaves it will give a better crop. It may be argued that such trees are more likely to damage by storm; this is, however, a risk that must be taken. Those palms having slender stems are to be preferred, as they are found to give more to the wind and so escape being broken off or blown over as may be the case with the unyielding stout tree. The tree must be satisfactory as regards health and vigour, otherwise the slenderness may be a sign of poor nutrition. The stem should be uniform and not rapidly tapering.

Some variation is seen in the length of the stalk of the bunch. It is not certain whether this is a permanent character or not, but observation has shown that plants showing this character are often good bearers.

The nuts should be narrow at the stalk end. Nuts wide at this point tend to squeeze one another out of the bunch. In order to compare one strain with another as regards this point, the method used was to measure the distance between two blocks, 1 inch high, the edges of which just touched the nut placed upright with the stalk end on a table. The husk should be thin. Whatever variety is being chosen, medium-sized nuts should be selected.

A table is here given in the Bulletin showing the characters of the varieties selected as regards (a) age of tree, (b) girth at 5 feet, (c) colour of mature nuts, (d) girth of nut, (e) thickness of husk, (f) length, (g) weight of dry nuts, (h) weight of water, (i) weight of kernel, (k) calculated weight of copra, (l) calculated number of nuts per ton of copra. The measurements for individual nuts of one and the same variety or strain exhibited remarkable uniformity. The calculated number of nuts to make a ton of copra showed a variation of 4,978 and 3,381 in the sixteen averaged results put forward.

COPRA FROM SAMPLE SEED-NUTS.

The kernels of the first eight varieties were exposed to the sun with the idea of preparing copra, but two rainy days set in and the copra became very mouldy. In addition to this there was some uncertainty as to whether some of the copra from two particular nuts had not been mixed together. The total weight of copra amounted to 57·1 per cent. of the kernels. . . . . The weather for five days was fine and dry with fairly strong south-east winds; the kernels were not exposed to the sun at all. Drying proceeded very well, and during that time 37 per cent. of the kernels dried out. In five more days excellent samples of copra were obtained from all the kernels, no signs of mould being seen. Each lot of copra was carefully weighed, the percentages of copra in the kernel being from 58·8 to 61·3, the average being 59·9.

CROPS.

It may be remarked that with 3,854 nuts to make 1 ton of copra or 193 to make 1 cwt., four nuts per tree per annum will give 1 cwt. of copra per acre with trees set 30 feet by 30 feet apart.

In considering this point it must be borne in mind that the figures are obtained from sixteen nuts only: they were, however, the nuts which came nearest to the average measurement of each kind; the kernels were most carefully weighed to the nearest gram (·0022 of 1lb.). It is true that they were selected nuts to start with, but as the improvement of coco-nut cultivation, as in most other agricultural industries, depends largely on careful selection, the figures may be taken as indicating what should be possible.

THE ENZYMES OF CACAO

The *Philippine Journal of Science*, Vol. X, Sec. A, No. 2, March 1915, contains an important paper by H. C. Brill on the enzymes of cacao. Tests were carried out with three different kinds of extracts with a view to detecting the presence or absence of well-known enzymes. Three series of experiments were run: namely, with an aqueous extract of the surrounding pulp, an extract of the fresh seed, and an extract of the clean fermented seed.

It was found that the pulp surrounding the cacao bean contains a greater number of enzymes than the fresh bean itself. The pulp shows activity for the enzyme casease, protease, oxidase raffinase and invertase.

The fresh bean gave reaction for casease and raffinase and very strong reaction for oxidase.

The fermented bean reacted for casease, protease, oxidase, diastase, raffinase, and invertase. The fermented bean shows the presence of protease and invertase, both of which are absent in the fresh bean but present in the pulp. These must have penetrated the membrane surrounding the bean during fermentation. Diastase is present, but absent in the extract from the fresh bean and from the surrounding pulp. This has been developed in the bean itself during the process of fermentation.

Therefore the conclusion is reached that the presence of these enzymes undoubtedly influence the character of the fermentation, and a moderate temperature during the fermentation is necessary in order that they may not be destroyed.

THE MANURING OF CACAO IN BRITISH GUIANA.

Inadvertently, reference was not made in this Journal to the following results on the manuring of cacao at the time they were published (October 1914) in the *Journal of the Board of Agriculture of British Guiana*. The summary, reproduced below, is taken from the *Bulletin of Agricultural Intelligence and Plant Diseases*, and shows very clearly the general results obtained. These results hold good under conditions similar to those obtaining at the Onderneeming Farm, British Guiana. It will be noticed that the safety of these results rests upon the fact that, by use of the probable error, the mean minimum increase that can occur has been determined. Thus, although the returns from manurial treatment may be *more* than those stated in the text, they cannot, in all probability, be *less*. It will be observed also that while mulching gives the largest increase, this increase is not remunerative owing to the heavy cost of the application. This point should be taken into account when considering the results of mulching in Dominica. (See Reports on the Agricultural Department, Dominica, and the *West Indian Bulletin*, Vol. XIV, p. 81, *et seq.*) The cost of mulching per acre in British Guiana is given as $66. Under most conditions mulch could be produced and applied at a considerably lower rate than $66 per acre. In fact, at this rate it would pay to grow mulch and sell it to the cacao planter in most places.

Manurial experiments carried out on cacao trees during five years (1909-13) have furnished the following results :—

Plots.	Yields in lb. per acre.	Cured cacao. Probable error.
Nos. 1, 4, 7, 11, and 16. No manure	2,080	± 71
„ 3, 8, and 13. Heavily mulched	2,699	± 113
„ 12 and 18. Sulphate of ammonia	1,963	± 155
„ 6 and 14. Superphosphate of lime and sulphate of potash	2,705	± 154
„ 5, 10 and 15. Superphosphate and sulphate of ammonia	2,375	± 213
No. 9. Sulphate of potash and sulphate of ammonia	2,242	± 217
Nos. 2 and 17. Superphosphate, sulphate of potash and sulphate of ammonia	2,465	± 99

Taking into account the probable errors, the highest total yield of cacao during the five years has been on the heavily mulched plots, which gave a minimum increase of about 435 lb. of cured cacao or about 84 lb. per acre over the mean of the five control plots.

The value of this increase is about $52, and the cost of the mulching approximately $66. On the other hand, the application of sulphate of potash and superphosphate of lime, costing approximately $14 during the five years, gave a minimun increase of 400 lb. of cacao worth about $50. The quick-acting nitrogenous manure—sulphate of ammonia—somewhat lessened the yields both when applied alone and in conjunction with superphosphate and sulphate of potash.

The results obtained in 1913, during which no manures were applied, showed that a residual effect remained from the previous years only in the case of the mulched plots and those receiving both superphosphate and sulphate of potash, whilst, where sulphate of ammonia had been applied, the yields were lower than in the case of the unmanured plots.

Liming experiments carried out on thirty-six plots showed no beneficial effect during the five years.

The effect of decreasing the shade, improving the tillage, drainage and sanitation of cacao trees is seen in the results obtained from 2 acres of trees taken over by the Agricultural Department in 1910. During the last five years the yields have steadily increased from a mean of 1,064 lb. to 4,494 lb. of cured cacao. Further experiments on the reduction of shade were carried out in 1913 on the same plots.

The results were as follows:—

	Per acre of 300 trees.	
	No. of pods.	lb. of pulp.
Heavily shaded	5,889	1,204
Very lightly shaded	9,546	1,823

The writers consider that the removal of shade has a greater influence on the yield of the trees than the improvement in drainage and cultivation.

COTTON CONFERENCE.

SECOND DAY'S PROCEEDINGS.

(Concluded.)

In summarizing Mr. Harland's remarks, the President impressed upon the meeting the distinction between ordinary and superfine cotton. They were two distinct types, and each meets a special demand on the market.

The President urged that very great caution should be exercised in embarking on the cultivation of 'superfine' cotton, for this is practically a distinct industry from the growing of 'ordinary' Sea Island cotton.

The above briefly summarizes the proceedings of the morning session. In the afternoon a discussion on matters relating to methods of seed selection was continued. In answer to the question by the President, Mr. Shepherd made a statement as to the amounts of seed of different types he had available for distribution to planters.

The Hon. R. L. Warneford (Antigua) then asked permission to read a Resolution which had been passed at a meeting of cotton growers held in Antigua prior to the Conference. The Resolution was as follows:—

'That it is desirable that the delegates from Antigua to the forthcoming Cotton Conference should discuss with the other delegates of the Conference, methods adopted for securing a satisfactory supply of seed for planting in each island, and that a definite line of procedure should be laid down as to the best mode of ensuring the purity of seed supply.'

The President in expressing his satisfaction that the delegates of Antigua had a distinct mandate of that kind, proceeded to outline the various considerations relating to the subject of securing and ensuring purity of seed. He referred to Mr. Balls' conclusions in Egypt that crossing is the one thing that breaks down types of cotton, and that every effort should be directed to securing pure strains. Mr. Balls' wire cage method was then referred to, and the President raised the question as to whether such appliances were necessary in raising pure strains in the West Indian islands. He pointed out that there was much less admixture of types of cotton in the West Indies than there was in Egypt. He also pointed out the dangers attendant on producing a specialized type for general cultivation, since if a demand arose for cotton possessing other characters, it might be difficult to supply it. Moreover, a specialized type of cotton would supply merely a specialized market, and in that case the island would be carrying, as regards cotton, all its eggs in one basket, as might be the case if superfine cotton alone were cultivated. The question then arose as to how many types should be grown at the Experiment Station in order to guard against the danger of losing from a district some characters which might subsequently prove to be desirable. The President asked Dr. Tempany if he had any observations to make in regard to the desirability of modifying the general methods of seed selection at present practised in the Leeward Islands, and also whether he considered there was need of adopting the wire cage method. Dr. Tempany expressed the view that at present he considered that methods were generally satisfactory, and that he had not yet had the opportunity of giving the wire cage method sufficient thought to make any definite statement concerning the desirability of adopting it in the Leeward Islands.

Mr. W. Nowell (Imperial Department of Agriculture) then put forward his opinions on the subject. He emphasized the importance of knowing first of all whether the buyers of cotton are sufficiently satisfied with the types produced, or whether they consider it desirable that more specialized types should be produced. If the spinners required a type of lint, for instance, which did not fluctuate in length more than a couple of millimetres, it would be necessary to produce a very pure strain, and to do this might necessitate the adoption of wire cages and other equipment leading to greater precision. But until it was quite understood by the growers what the spinners required, he considered that the present methods were satisfactory. Mr. Nowell also emphasized the danger of cultivating one pure strain to the exclusion of all others; for in that case it would be dependent upon a special demand that might at any moment collapse. There was also the consideration that if the exclusive strain was no longer desirable and it was necessary to recover the characters that had been eliminated in the other strains, these would have been lost and then the planter would be committed to one particular type, and would be limited to selection from that type in the future.

A discussion then arose as to the relative merits of the seed produced at the Experiment Station in St. Kitts, and that produced by Mr. A. O. Thurston for planting on his properties. In the course of this interesting discussion it was shown that while Mr. Thurston practised mass selection in the production of his seed for planting his original material was Stirling seed, which was a pure strain produced from a single plant of Rivers' seed on Stirling estate in Barbados. The story of the origin of Stirling S was outlined by Mr. Ballou (Imperial Department of Agriculture), who was on the original selection committee and actually selected the plant from which the strain known as Stirling S originated.

The President pointed out that the common origin of La Guérite and Douglas seed emphasizes the idea of selection from one type of plant, and shows that purity of strain once it has been procured can be maintained, provided the environment is a pure one. In other words, once the pure strain has been obtained and can be protected from crossing with other strains, mass selection is sufficient to maintain the general standard without deterioration for a number of years.

The President mentioned the recommendations that reached him from time to time to obtain seed for planting from particular marks of cotton possessing good characters, but these characters were probably, in the most cases, the result of good environment. The present discussion had shown that such change from one type to another was not desirable, but that the object aimed at should be the creation of a pure strain. One of the most important points, it was stated, at this stage of the Conference, was that there do exist in the various islands, strains of cotton which are eminently satisfactory to the spinners, and the aim of experiment station workers should be rather to retain and continue to produce these strains than to try to produce new types of cotton. St. Kitts was probably the island in which the strain of cotton was most uniform. In St. Vincent there were dangers in that they were cultivating two distinct types, so that unusual care in seed selection is necessary there. The President suggested to the meeting that he should request the Fine Spinners to inform him in what respect they considered the present types of cotton could be improved in order to meet with their entire satisfaction. He then put the following Resolution before the meeting: 'That in the opinion of this Conference, the purpose of obtaining a supply of pure seed for planting purposes will be best attained by the method of single plant selection followed by cultivation in progeny rows from which seed plots are planted from which com-

mercial supplies are derived, and that the methods described by the experiment station workers in their remarks to this Conference to-day are satisfactory in principle, and are such as are to be recommended to be followed in practice for the present.'

The Resolution was agreed to unanimously.

The President then raised the point as to why one strain of cotton produces lint of varying quality in different districts at different times. Specific reference was made to the case of Montserrat. The President suggested that one reason why Montserrat had not produced a cotton which had brought so high a price, was on account of the character of the soil in that island, which was less uniform than that in St. Kitts aud St. Vincent, and that the soil of Montserrat was not so deep as that of the other two islands. Reference was also made to climatic changes in regard to Montserrat and St. Vincent. Soil conditions are more readily affected by fluctuations in weather in Montserrat than the soil conditions in St Vincent and St. Kitts.

In regard to Montserrat, Mr. Robson said that cotton of the Heaton 9 type grown on the leeward side of the island in 1913-14 obtained a slightly higher price than that grown on the windward side, and yet more care was exercised to keep the seed pure on the windward side. Assuming the rainfall was equally distributed, it would point to some fluctuation in the characters of the cotton itself.

An interesting point was then raised in connexion with the acclimatization in one island of a pure type of seed produced in another. Mr. Robson had grown Douglas seed in Montserrat for two years, and in the second year the St. Kitts seed compared favourably with Heaton 9. Hence it would seem that it might pay Montserrat to use a type of seed that had been produced in St. Kitts.

The discussion then turned to the effect of crossing of type upon lint length. Mr. S. C. Harland (St. Vincent) gave a brief account of Balls' theory of lint length and unit characters. It appears that Egyptian cotton, which is comparatively short stapled, has a lint length associated with fewer unit characters than ordinary Sea Island. Similarly ordinary Sea Island has fewer unit characters than 'superfine'. If two types of cotton are crossed having a different number of unit characters for lint length, respectively, there will be found in the second generation a series of permutations and combinations of these unit characters of length, some resulting in short fibres, others in long. It was Mr. Harland's idea that the number of short fibre plants that may be found at times amongst the St. Vincent superfine type of to-day, was due to the fact that the superfine was crossed with the ordinary and produced other cotton with a lower number of lint factors in the second generation. If crossing continues there may result still further reduction, and if carried on long enough, this crossing of plants with different lint lengths might conceivably even result in the production of individual plants producing naked seed. Mr. Harland had observed a plant having a boll with seed possessing no lint whatever.

Mr. Harland then called attention to the danger of retrogade mutation in the maintenance of pure strains. In certain experiments in St. Vincent a new rogue had arisen due to mutation, which had proved to be a most undesirable type. In connexion with these remarks, particularly those concerning mutations, the President called attention to the necessity for purity of type being maintained in the Experiment Stations, so that if anything went wrong with the commercial supply, the experiment station workers would always be in the position of having a pure type of seed available. The afternoon session closed with a short discussion started by Dr. Tempany as to the possibility of mutations occurring in pure strains in the absence of hybridization. This led to the President's calling attention to the important fact that when we talk about a pure strain we are talking about a strain pure only in regard to a limited number of characters, in the case of the cotton plant, in those characters of commercial significance. Theoretically only is it possible to have a strain of cotton perfectly pure in every respect. When we talk of uniformity we are talking about three or four characters that have caught our attention commercially. In general parlance, a pure strain of cotton is a cotton which is pure only as regards general habit and certain characters of the lint.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 1, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 200 bales of West Indian Sea Island cotton have been sold, chiefly St. Vincent at 18*d.*, with a few bales at 21*d.*, and Montserrat and Antigua 15*d.* and 16*d.*

Prices are firm, but we understand the demand for Sea Island yarns is rather limited, as they go to supply luxuries.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 8, 1916, is as follows:—

ISLANDS. The crop having been all disposed of, there being left no unsold stock either here or on plantation, the market is closed for this season.

The following quotations are only nominal:—

We quote, viz.:

Extra Fine	31c. = 20½*d.*	c.i.f. & 5 per cent.
Fully Fine	30c. = 20*d.*	,, ,, ,, ,,
Fine	29c. = 19½*d.*	,, ,, ,, ,,
Fine off in class	28c. = 19*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. The market remains firm, with only very limited offerings on the general market. The unsold portion of the crop is largely in the hands of a few parties, having been previously bought by them in expectation of a better market later on. Now and then the Factors put out for sale certain lots, admitting of our buying at quotations.

We quote, viz.:

Fancy	31c. = 32¼c.,	landed.
Extra Choice	30c. = 31¼c.,	,,
Choice	29c. = 30¼c.,	,,

The exports from Savannah for the week were, to Northern Mills 50 bales, Southern Mills 130 bales, and from Jacksonville to Northern Mills 407 bales.

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester up to April 8, were 658 and 443 bales, respectively.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

Methods employed in manurial experiments with cacao and coco-nuts in the West Indies are compared in the editorial for this issue. Attention is drawn to the lack of uniformity, and to the caution necessary in attaching absolute value to statistics.

On page 150, the account of the proceedings at the recent West Indian Cotton Conference is continued. In the next issue the third day's proceedings will be dealt with.

An interesting article on land settlement schemes for ex-service men appears on page 157.

Insect Notes, on page 154, concern insects attacking onions; Fungus Notes, on page 158, deal with mychorizae.

Maize Show at Antigua.

The first Maize Show held in the West Indies took place in Antigua on March 30, 1916. The show was opened by His Excellency the Acting Governor, who was met on arrival by Mr. A. P. Cowley, Chairman of the Agricultural and Commercial Society, and by Dr. H. A. Tempany, Superintendent of Agriculture for the Leeward Islands.

After introductory remarks delivered by His Excellency and Mr. A. P. Cowley, the meeting was addressed at considerable length by Dr. Tempany. In his opening remarks he referred to the significant fact that the meeting indicated active interest in a minor crop, in spite of the fact that the price of the staple product of the island—sugar—was at a very high level. This interest, like that which had been shown in the recent Cotton Conference in St. Kitts, indicated that West Indians were not blind to the danger and folly of placing all their eggs in one basket. While the price of sugar was high, it had to be remembered that that for corn was high also. The total production of maize of the world had been steadily increasing during the past twenty years, but increasing consumption was more than outpacing production, and the result had been seen, during the past few years, in a slow but steady upward trend in prices. This had been felt in Antigua, and there had been in consequence a tendency to increase local production. There had also been a marked decline in the imports of maize in Antigua; this did not indicate decreased consumption; there was reason to believe that the reverse was the case. Dr. Tempany thought that no maize ought to be imported into Antigua at all, and also no corn meal. He then went on to outline the development of the maize plant: touched on the operation of kiln-drying grain, and referred to Dr. Watts's observation that a kiln-drying plant was simply an insurance policy against losing the amounts of grain which were produced in excess of immediate requirements.

The speaker then made reference to certain pests of corn, and indicated their distribution in the island and methods of control. He further alluded to the manurial requirements of the crop, and finally touched upon utilization of by-products, as, for instance, the employment of husks in stuffing beds and pillows, and the sale of silks for their medicinal value. He lastly referred to the importance of selection in the improvement of the yield per acre in Antigua. In this connexion the Agricultural Department had reserved to itself the right of taking, for breeding purposes, any desirable ears which they choose out of the exhibits that day.

The prizes were distributed later in the afternoon by His Excellency the Acting Governor.

As regards the quality of the exhibits, the general level was exceptionally high, and in the classes for corn on the cob and shelled grain a remarkably fine run of maize was shown. The prize for the best twenty-four ears of corn, and also the champion prize for the best single ear were won by Pares estate. The champion ear was a fine specimen of corn of the red flint type, practically pure to all appearances, measuring 11

inches in length and possessing sixteen rows of grain very regularly arranged. Much interest was evinced in the class of exhibits showing methods of preparing corn and corn meal as human food.

The list of classes was as follows: Class I, twenty-four ears of corn grown by an estate; Class II, 12 lb. of shelled corn grown by an estate; Class III, 4 lb. of corn meal and cob meal ground on an estate; Class IV., 4 lb. of corn meal prepared from locally grown corn; Class VII, 8 lb. of corn dried for fodder; Class VIII, any other article made from any part of the corn plant; Class IX, champion ear of corn exhibited in any class; Class X, collection of dishes illustrating various methods of serving corn and corn meal as food.

At the conclusion of the show Mr. Cowley moved a vote of thanks to His Excellency for opening the show, and referred to the great interest which the late Governor, Sir Hesketh Bell, had always shown in the maize industry.

The Antigua Agricultural and Commercial Society.

The useful activities of this Society are summed up editorially in the *West India Committee Circular* of March 9, where it is said a recent report by the Chairman of the Society 'indicated what a wide field of local affairs the Antigua Agricultural and Commercial Society covers, and what a useful position it fills in the community under its present able management.'

At a recent meeting mention was made of the success which had attended the recent maize show and the 'At Home' given by the Society on that occasion. The account also contains a report of the Antigua delegates on the recent Cotton Conference which was held in St. Kitts during March. The principal points dealt with are enumerated in this report with particular reference to Antigua, but the report goes on to say, 'it would be impossible to put forward anything like a full account of a conference which lasted for five days, and at which scientific men met practical cotton planters and merchants and participated in the most harmonious and interesting discussions it had ever been the lot of the delegates to take part in.'

Most consideration in this report was given to matters relating to the protection of the interests of cotton growers. These matters will be dealt with in due course in the articles on the Cotton Conference which are now running in the *Agricultural News*, but it may be mentioned here, that according to the report under notice, the necessary steps will probably be taken in Antigua to bring about the formation of an Antigua Cotton Growers' Association. This will constitute one important step towards organization and co-operation in the cotton industry throughout the West Indies.

Improvement of the Sugar Beet.

From the point of view of selection for improved varieties or strains, the sugar beet differs essentially from the sugar-cane on account of its being propagated by seeds. In selecting sugar beets it is obvious that because of the large amount of hybridization that takes place in the field, there must be produced a much larger number of mutations or 'sports' than can appear in the case of the sugar-cane, which is almost entirely reproduced vegetatively. On the other hand, a desirable strain of beet is not as easily preserved as a desirable strain of sugar-cane. In other words, there is more chance of coming across beet plants abnormally rich in sugar, but there is less chance of keeping that strain pure than in the case of sugar-cane.

In *Nature* for March 2, 1916, appears an article on the application of scientific methods in the improvment of the sugar beet. This shows that from 1838 to 1868 the percentage of sugar in industrial sugar beets was raised from 8·8 to 10·1. This was achieved by the so-called 'physical' selection. Then came chemical selection and the polariscope, which caused a rise from 10·1 in 1868 to 18·5 in 1912. The higher sugar contents were due to some extent to improved methods of individual selection.

Germinating Coco-nuts.

There is an interesting and exceptionally well illustrated article on germinating coco-nuts in a recent issue of the *Journal of Heredity* which brings out the remarkable adaptations the coco-nut possesses for growing in a dry soil and climate. One illustration shows three stages in the process of germination, indicated by the different sizes and shapes of the cotyledon or 'nursing foot' that grows into the central cavity. It is stated that the formation of a soft, watery, superficial layer on the endosperm after germination begins, indicates the presence of an active fat-splitting principle in the milk, which partly digests the meat and transforms it into such a condition that it can be readily absorbed by the growing cotyledon. The writer adheres to the theory that the coco-nut is not naturally dispersed by the sea. The coco-nut probably originated in Central America, and has found its way to littoral or island shores through the agency of man.

Manchester and Colonial Sugar.

According to a note and comment in the *International Sugar Journal* for March 1916, the Manchester School of Free Trade has been the backbone of the resistance to all projects for enabling the British Colonies to supply the Mother Country with a larger share of her needs in sugar. It is stated that even at the present time the Directors of the Manchester Chamber of Commerce have recommended that there should be no departure after the war from the old precepts of free trade, and that no restrictions should be placed on imports of enemy goods. At a meeting of the Chamber, however, this recommendation of the Directors was defeated by a large majority of members, and it would appear that in spite of the views of the Board of the Manchester Chamber of Commerce, public opinion in that city is now sufficiently strong to ensure a radical change of policy after the war.

INSECT NOTES.

INSECTS ATTACKING ONIONS.

The successful development of an onion industry has been frequently referred to in the Department's publications from time to time during the past two years, and in July 1915, a pamphlet, No. 78 of the Pamphlet series, on the cultivation of onions, was issued. In the *Agricultural News* (Vol. XIII, No. 314, p. 157) for May 9, 1914, a short article appeared on the control of the onion thrips in the United States.

This article was a summary of a portion of a paper which was published in the Year-book of the United States Department of Agriculture, 1912, entitled Insects Injurious to the Onion Crop, by F. H. Chittenden, D.Sc.

The notes on the onion thrips and its control given below are reproduced from the issue of the *Agricultural News*, as noted above. Dr. Chittenden's article is drawn upon for further statements regarding the onion and certain of its pests in the United States, and with this is given information with regard to pests in the West Indies.

The onion crop is a valuable one in many places, and the experience of planters in the West Indies during the past few years goes to show that in these islands, onions when properly grown, cured, packed and shipped form a secondary crop which is capable of yielding substantial profits.

Fortunately this crop is attacked only by a few different kinds of insect pests, of which the onion thrips is the most serious in the United States, and perhaps also in the West Indies; although in Antigua the grubs of the brown hard back have been known to cause very serious losses.

It is stated that in one district in Indiana a few years ago the losses in one year resulting from the depredations of the onion thrips over an area of 1,500 acres, amounted to $54,000—an average toll of $36 per acre. In spite of this loss the profits were sufficiently satisfactory, so that in that district the area planted in onions in the following year was doubled, when it is satisfactory to note, the thrips were not so numerous.



FIG. 8. Onion Thrips. *a* Adult, *c* and *d* immature thrips. Enlarged. (*U. S. Dept. of Agriculture.*)

An interesting instance of the destructiveness of the onion thrips in the West Indies has just come to the notice of this Department.

A planter in Antigua had 10 acres of onions which grew most luxuriantly and gave promise of an unusually heavy yield. The season had been one of abundant rainfall, and as a result, onions in common with other crops grew unusually well. These onions were attacked by thrips, and in about three weeks from the time when the attack was first noticed, the crop was ruined. Instead of the estimated 1,400 crates, the 10 acres gave a return of less than 300 crates.

THE ONION THRIPS (*Thrips tabaci*, LIND.).

'Of the insect enemies of the onion, the onion thrips (*Thrips tabaci*) is the most important. It causes injury to the onion crop practically throughout the country, producing a condition somewhat generally known as 'white blast', 'white blight', and 'silver top'. It is also the cause of 'scullions' or 'thick neck'—terms used for the undeveloped and unmarketable bulbs.' This thrips is now found in practically all cultivated fields in the United States, as well as in many uncultivated areas, so that there is always danger of infestation to onions and other susceptible crops, whether grown in new or in old land. 'Observations tend to demonstrate that in some localities, at least, it makes little difference as to the previous crop.

'The life-cycle has been found to require, under the most favourable conditions, about three weeks. Thus a dozen or more generations might be produced during a season. 'Besides onions and related plants, this thrips attacks cabbage, cauliflower, parsley, cucumber, melon, pumpkin, squash, kale, turnip, tomato, seed beets, blackberry and strawberry. Of ornamental plants, it does much injury to carnations and roses, and more or less injury to aster, blanket flower (Gaillardia), honeysuckle (Lonicera), daisies, nasturtium, narcissus, mignonette, candytuft (Iberis), four o'clock (Mirabilis), and cone flower or golden glow (Rudbeckia). Very serious injury is frequently committed to cucumbers and carnations in greenhouses, the damage sometimes amounting to the destruction of entire plantings.

'Kerosene emulsion, whale-oil or fish-oil soaps, and tobacco or nicotin extracts are recommended for use, their application being commenced early in the season. The importance of clean methods of field management, including the destruction by burning of culls, tops, and injured plants after the crop is gathered, is emphasized. Investigations in Texas and Indiana have shown the following formulas to give the most successful results: (1) Nicotin sulphate 3·2 oz., cresol soap 3 pints, and water 50 gallons; (2) nicotin sulphate 4·3 oz., whale-oil soap 4lb., and water 50 gallons. When spraying is once begun it should be continued at intervals of from seven to ten days, in case there is no heavy rainfall during this period, and no surrounding breeding host for the species. The spraying should, as a rule, be continued up to three or four weeks of harvest time. In spraying for thrips, the nozzles should be held well down upon the plants and the spray applied with as much force as possible.

'Where setts are used considerable injury may be prevented by dipping them about a week before planting in nicotin-sulphate at about the same strength as used for spraying, and then giving two dippings in the same insecticide at planting time, or in almost any other of the solutions mentioned, including kerosene emulsion. Since this thrips displays preference toward cabbage and cauliflower, neither of these two crops should be grown contiguous to onions.'

The nicotin sulphate may be obtained in convenient form for use in the preparation known as Black Leaf 40, prepared and sold by the Kentucky Tobacco Products Co., Louisville, Kentucky, U.S.A.

NATURAL CONTROL.

It is well known that rain, especially when falling in heavy showers, destroys great numbers of this insect.

There are also many insect enemies of the onion thrips known in the United States, one of which, the spotted lady-bird (*Megilla Maculata*), occurs in the West Indies. It is likely that further study of this pest will reveal the presence in these islands of other predaceous and parasitic insects which exert some measure of control on this pest.

This article on insects attacking onions will be continued in the next number of this Journal.

H.A.B.

THE POISONING OF CRABS.

The following note has been forwarded by the Agricultural Superintendent, St. Lucia, as being of general interest. The note has been prepared by Mr. R. W. Niles, Overseer and Agricultural Officer, as a result of his experience in poisoning crabs at the Botanic Station, St. Lucia:—

Crabs are often serious pests in gardens near the sea and also in swampy land, and one of the ways for destroying them is by boiling corn meal, and stirring in about a stick of phosphorus to 8 gallons of meal whilst it is very hot, in order to dissolve the phosphorus.

This mixture is then put out about a dessert spoonful in each hole, and the hole plugged with earth or any other suitable material near at hand.

Owing to the present war, corn meal has become a very expensive item, and the writer finds that breadfruit (which is very common in St. Lucia and many other West Indian islands) or green bananas, is quite a suitable substitute for corn meal. The breadfruit or bananas should be cut into pieces and boiled until soft; these should then be mashed to form a pulpy mass, and the phosphorus stirred in at the same rate and in the same manner as in the case of the corn meal.

GREEN DRESSING TRIALS IN DOMINICA.

It is stated in the Report on the Agricultural Department, Dominica, for 1914-15, that seeds of the following five species of green dressings were received from Dr. Cramer, Chief of the Selection Station, Buitenzorg, for trial at the Botanic Gardens:—

Tephrosia Vogelii
,, Hookeriana, var. amoena
,, candida
Indigofera suffruticosa
Clitoria cajanifolia

Tephrosia candida has been under trial in Dominica for several years, and a full account of its habit of growth, etc., appeared in the Annual Progress Report for 1911-12. It has been found an extremely useful plant for the purpose. A supply of seed may be obtained by planters on application at the proper season.

Tephrosia Hookeriana, var. *amoena* is identical with the plant which has been grown in Dominica for several years as *Tephrosia purpurea*. The former name is the correct one. (See *Kew Bulletin*, No 1, 1914, and *Agricultnral News*, Vol. XIII, p 101.) A detailed account of this species appeared in the Report for 1911-12. Not growing so tall as *Tephrosia candida*, it nevertheless forms a good shade and is well worth the attention of planters.

Tephrosia Vogelii is in habit and rate of growth very similar to *Tephrosia candida*. Sown in August, it stood the following April some 5 feet high and showed no signs of flowering.

Indigofera suffruticosa is a plant having a similar habit to the common West Indian indigo (*Indigofera Anil*) About three months from sowing the foliage of this species was severely attacked by a green fly which caused many of the leaves to drop. This, however, did not seem to check the plants seriously.

Indigofera suffruticosa, as a cover crop, as far as present experience goes, is in no way superior to *Indigofera Anil*, a plant which has been somwhat neglected as a cover crop. The ready way in which the latter establishes itself in Dominica, and the rough treatment which it can stand in the way of being cut down without losing its vigour should make it popular with planters, and every effort should be made to encourage its growth, especially between young cultivation; it does not, however, thrive under the shade of lime and other trees.

Clitoria cajanifolia, Barth., is a species highly spoken of as a green dressing in Java, where it is regarded as one of the best cover crops grown. There it lasts for two or three years and forms a dense cover, protecting the soil from wash, especially on hillsides. The few seeds that were received in Dominica have germinated well, and the plants are now 12 to 18 inches high, and there is no indication of flowering at the time of writing. It will be necessary to replant a larger area at the Station when seeds a e available, before sufficient seeds can be raised for trial by planters.

There are several species of Clitoria common in the West Indies, and all assist in conserving nitrogen in the soil; but no attempt has been previously made in Dominica to form a plot of these, and to use them as a cover crop.

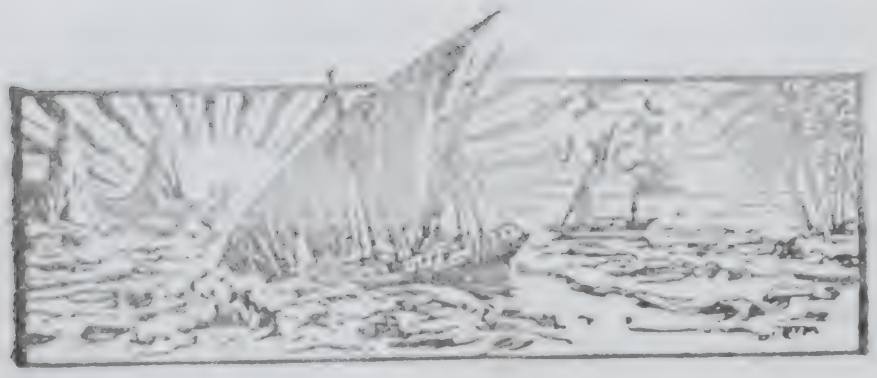
PLANT INHERITANCE OF MALE CHARACTERS ONLY.

The following extracts dealing with the interesting phenomenon of patrogenesis are taken from an article on the subject in the *Journal of Heredity* for March 1916:—

A cross between *Tripsacum dactyloides*, female, and *Euchlaena mexicana*, male, has been carried through three generations without exhibiting any indication of the characters of the female parent

The parental stocks were *Tripsacum dactyloides* and *Euchlaena mexicana*. Tripsacum is a perennial grass native in many parts of eastern United States, and is of no economic importance. Euchlaena is an annual grass native in Mexico and frequently grown in the United States for forage under the name of 'teosinte'. These species not only belong to different genera, but are placed in separate groups of the tribe Maydeae. The two genera, together with maize or Indian corn, are the only American representatives of the tribe. The plants differ profoundly in general appearance as well as in structural details.

In attempting to explain this complete absence of the characters of the female parent two alternatives may be considered: (1) The characters of the female parent have been completely masked by those of the male, or (2) the male nucleus devolops in the ovary to the complete exclusion of the female, representing in a way the counterpart of parthenogenesis. In the three generations of the progeny of this hybrid at least 350 plants have been examined. This and the fact that a great variety of conditions has called forth great variation and induced many abnormalities without evoking any indication of Tripsacum characters have caused the first alternative to be dismissed. If the second alternative be adopted, we are compelled to look upon the results of this cross as a special type of inheritance not previously recognized. Hybrids showing a predominance of the characters of the male parent have been described as patroclinous, but in this cross and its successive progenies no trace of the characters of the female parent has been detected. No true hybridization or conjugation between the two nuclei appears to have taken place For this form of false hybridization the name patrogenesis is proposed. The term patrogenesis will also serve to place the phenomenon in proper contrast with parthenogenesis. This is rendered appropriate by the occurrence of what appears to be true parthenogenesis in Tripsacum when pollinated with maize.



GLEANINGS.

The Reform of the Man of Science is the title of a suggestive article in *Nature* for March 16, 1916. It advocates that there should be less exclusiveness in scientific circles, and that an attempt should be made to include in learned societies successful financiers and business men, particularly those of great administrative ability, even though they may not be deemed scientific in the academic sense.

A note in the Barbados *Advocate* of April 20 calls attention to the scarcity of pigs in that island, the price of pork having gone up considerably. It is said that the establishment of sugar factories in districts where the windmill formerly prevailed has resulted in the production of less by-products such as are used as pig food. It takes not less than 200 pigs to keep up the weekly supply of pork dressed at the Barbados public abattoir.

According to *The Board of Trade Journal* for February 3, 1916, contracts have been entered into between the Mexican Government Commisson for the Regulation of the Henequen Industry and the hemp producers of the States of Yucatan and Campeche on a profit-sharing basis. It appears therefore that the institution of the commission has, to all intents and purposes, transformed the hemp industry in Mexico into a Government monoply.

An interesting note on the fluctuations in prices of pig products appears in *The Board of Trade Journal* for January 20, 1916. It is pointed out that in the United States hogs are maize fed, and that the biggest profits are got when the animals are fed on good maize. Consequently the price of good maize effects the price of maize fed hogs. So closely related are the prices of maize and hogs, that an approximate estimate of the latter can be made from the price of the former.

Practically the whole of the black soil crop of sugar-cane in Barbados for 1917 has been planted with the seedling B 6450, and in the red soil district about half the young crop is composed of the same variety. B.6032 gives promise of very satistactory results, and a small area of this has been planted. It may be recognized by unusually stout shoots and broad leaves. This seedling is said to be hardier than B.6450, but judgment must be reserved until it has been generally tested (Barbados *Agricultural Reporter*, April 22, 1916.)

A useful and important general suggestion is contained in a booklet by John D Rockfeller, Jnr., entitled The Colorado Industrial Plan. This seeks to solve the difficulties attendant on the harmonious working of capital and labour. It advocates the representation of employees on the Board of Directors in any industrial concern, and shows that such a plan is at the present time successfully operating at the coal and iron mines of the Colorado Fuel and Iron Company. The booklet is well worth careful perusal by all those concerned with capital and labour.

We have received a copy of the first number of *Genetics*, a new periodical devoted to recording American investigations in full detail, bearing on heredity and variation. Subscriptions amounting to 270 have been pledged in advance, which is a sign that this Journal is heartily welcome by those interested in genetics in the United States. The Journal is well illustrated and edited. The papers are purely scientific and have no special reference to agriculture, excepting so far as all biological information has eventually its application in the production of crops and animals.

The reaping of the sugar-cane crop in Barbados was going on apace during April. It is difficult to say what would have happened this year or how far the reaping season would have been prolonged without the help of factories, which bought outside cane. The yield per acre has been excellent everywhere, and the juice has reached a high standard of purity. The general return of first crop canes per acre is 30 tons; here and there, however, fields have been cut which have given as much as 44 tons. (Barbados *Agricultural Reporter*, April 22, 1916.)

In connexion with British trade after the War, the Board of Trade has issued a report of an advisory committee with respect to measures for securing the position, after the war, of certain branches of British industry. The report is of general interest, but it would have been satisfactory to see sugar in the list of branches of industry to which attention should be directed. In this connexion it may be noted that the West India Committee have published their correspondence with Colonial Governments on the possibilities of the sugar-cane industry extension, in pamphlet form. A copy of this pamphlet has been sent by the Committee to the Prime Minister.

Paper is being manufactured in Cuba from the megass of sugar-cane. The megass is carried from the sugar mill in cars to the paper mill where it is digested in live steam, beaten into pulp, treated with chloride of lime, and eventually made into the paste, which when run over wire screens dries as paper. The paper obtained from cane pulp is said to equal if not exceed in quality the paper manufactured from imported kraft stock, and it can be produced and marketed at a price considerably lower than that quoted for kraft paper. The output is sold in Cuba for local consumption. Further information on the subject will be found in the *Journal of the Royal Society of Arts* for December 31, 1915.

LAND SETTLEMENT FOR SAILORS AND SOLDIERS.

Active steps are being taken by the Board of Agriculture in England to promote the settlement and employment on the land of sailors and soldiers whether disabled or otherwise, on discharge from the navy or army. It will be remembered that similar steps are being taken by the Royal Colonial Institute in regard to the land settlement of ex-soldiers in the Dominions and Crown Colonies. In this connexion we may refer to the visit of Major Boosé to the West Indies recently, and to Sir Rider Haggard's tour in South Africa and Australia on similar mission.

The recommendations made in the final report of the Committee appointed by the English Board of Agriculture are published in the *Journal* of the Board for February 1916. They are of great general interest, especially in the West Indies, where so much has been done in regard to the land settlement of the peasant.

The Committee divides land settlement into two kinds: (a) settlement by the State, and (b) settlement by County Councils. Taking settlement by the State first, the Board, it is recommended, should be empowered to acquire land either by purchase (voluntarily if possible, but failing this, compulsorily), or by lease (voluntarily). Settlement on the 'colony system' is regarded as the only system possible for the State, owing to the impracticability of organizing isolated holdings. This 'colony system' idea corresponds with the settlements one finds in Grenada and St. Vincent. The Committee considers that the ideal settlement would be a village community of at least 100 families all interested in the cultivation and development of land, but including amongst them those engaged in the trades subsidiary to agriculture. Great importance is attached by the Committee to the possibility which the 'colony system' offers for developing the social side of country life. It is generally recognized that one of the principal causes of the depopulation of country districts is the social limitations thereof.

The most suitable holding for men with little or no previous experience of agriculture is believed to be the fruit and market gardens. Such holdings can be made to produce a larger return per acre than those cultivated otherwise; further, a larger number of such holdings can be created on a given quantity of land; also an inexperienced man can be trained more easily to grow these crops; the planting of fruit trees could be undertaken by the State and the cost included in the rent; and lastly, such holdings facilitate the successful working of co-operative marketing.

The question of ownership or tenancy is discussed in the report at considerable length, and the conclusion is reached that for the purpose in view, a system of tenancy is preferable to one of ownership.

To reduce the initial cost of equipping small areas of land with houses and buildings it is thought that the Government might hand over to the Board, free of cost, the military hutments erected all over the country, the best of which could be adapted to form comfortable rural cottages and farm buildings. Amongst other equipments, the Board suggests a central depôt and store for the produce grown; a central club room; and also, possibly, a private telephone system. Any necessary works of road making, water-supply, drainage and fencing would be carried out by the Board.

It is suggested that provision should be made for expert guidance. Each colony should have a director at a salary of £500 a year with house, and also a horticultural instructor who should be responsible under the director for the actual training of the small holders, and whose salary might be £120 a year with house. The Colony could appeal to the agricultural research institutions for special information as might be required.

As regards co-operation, the Committee realize that it can only result successfully from education and must have time for growth. However, a large degree of organization and co-operation is ensured by the appointment of a director, and by the establishment of a central depôt.

As regards the provision of working capital, the Committee reject the proposal that the State should make direct advances; instead, they consider that taxation should be reduced; that ex-service men with no capital should be started at a weekly wage; and that a co-operative credit bank should be established in connexion with each colony. As an experiment it is recommended that the State should set aside a small sum of money to be lent to the credit bank so set up; 5*s.* an acre is suggested as the amount. The residents should be invited to take up shares and deposit there savings with the society. Limited liability is suggested, with State guarantee of members' deposits.

In order to place the scheme on a sound economic basis, sufficient rent should be charged to meet the interest on the cost of the lands, equipment and repairs. The cost of the educational staff of the Colony would not be charged on the rent.

After outlining their scheme, the Committee refer to the need for prompt action; and they recommend that immediate steps should be taken by the Board to acquire and equip land for three pioneer colonies (illustrating the different types of holdings) comprising 5,000 acres in all, and that additional land should be acquired for the settlement of further colonies. From estimates given by the Committee it appears that the cost of establishing the three pioneer colonies would not be more than £334,000. These colonies would accommodate more than 300 families. To provide for at least 4,000 or 5,000 families a sum of £2,000,000 should, it is recommended, be placed at the disposal of the Board.

As regards the settlement by County Councils, that has already been in operation for some years. Ex-service men who wish to settle in the neighbourhood whence they came will probably not be prepared to go to the State colonies, and for those men the County Councils should make special provision and establish colonies similar to the State colonies outlined above. It is recommended that the Small Holdings Act should be amended so that the Board may become partners with the County Councils in the whole business of providing small holdings under the Act, and may pay half of any losses that may be incurred. Several other amendments of the Act are also suggested to facilitate settlement and make it more attractive.

In his address to the Legislative Council of St. Vincent, the Administrator said the general situation of the Colony gives no real ground for pessimistic outlook in the future. Trouble has been experienced in the matter of selling arrowroot but that was regarded as merely a temporary affair. It had to be admitted, however, that the last few years had witnessed a falling off in the cotton industry, both as regards area and yield per acre. His Honour invited cotton growers to take full advantage of the assistance that was being offered by the Local Agricultural Department, as well as by the Imperial Department of Agriculture. There had been a steady increase in the exports of vegetable produce and live-stock to neighbouring Colonies, and there were indications of much progress and enterprise in connexion with the cultivation of coco-nuts. The area planted already exceeds 1,000 acres and will probably reach 2,000 acres in the near future

FUNGUS NOTES.

MYCORHIZAE.

The significance of the association of fungus hyphae with the roots of plants, in the combinations known as mycorhizae, is of great interest, and is not without bearing on certain cultural and pathological problems arising in tropical agriculture.

The position of the fungus in the mycorhizal associations allows of their separation into two usually well-marked classes, in one of which the hyphae are mainly external, clothing the rootlets in a weft more or less close, the few which penetrate the root being intercellular; while in the other the hyphae are mainly found inhabiting the cells of the cortex with but few connexions with the exterior. The terms ectotrophic and endotrophic are used to distinguish the two.

Mycorhizae with the fungus external are very common on temperate forest trees, often causing the suppression, partial or complete, of the root hairs. It has been generally supposed that the fungus played some part in the nutrition of its host, especially in soil rich in humus, an idea which the general presence of mycorhizae on many forest and heath plants seemed to support. So far as the matter can be tested by experiment, however, little or no evidence has been obtained of any advantage gained by the 'higher' plant. A recent writer* concludes, after an exhaustive investigation, that the ectotrophic mycorhizae of forest trees are not in any sense symbiotic associations, but are instances of parasitism of fungi on the roots of the trees.

The border line between symbiosis and parasitism is a vague one, and it must be noted that in this case the parasitism is at any rate so nearly approaching symbiosis that in normal circumstances the host cannot be regarded as being to any appreciable extent harmfully affected by it; the only question being as to whether under any circumstances an actual benefit is obtained. It seems very probable that there exist on different plants gradations from actual harmful parasitism, through toleration, to some degree of symbiosis, so that each case must be considered on its merits.

In dealing with the endotrophic mycorhizae we are on firmer ground, since it is known that in some cases at least the association is constant and essential to the higher plant. Bernard showed that in the case of some orchids the seeds refuse to germinate until they are infected with the fungus, and in others the development of the seedling ceases unless the fungus is present. But what part is played by the fungus in the combination remains obscure. Analogy with the bacterial nodules of leguminous plants has suggested that it is the collection of nitrogen, in exchange for carbohydrates, but there is little experimental basis for the assumption. In well developed cases there is an inward progression from normal hyphae to monstrous forms, with an absorption of the latter by the host, but the origin of the material thus made use of, i.e., whether it comes from the host or from without, is not known. The scanty connexions of the hyphae with the exterior appear to be much more related to entry (often through the root-hairs) than to communication with an external source of food.

It has recently been shown that in *Calluna* (ling), the fungus which is present in the mycorhizae permeates the whole plant.

W.N.

*Dougall, W.B. *American Journal Botany* I, 51-74.

LIVE STOCK NOTES.

These notes have been compiled from published statements in the Departmental Reports from the different islands, and will be found interesting by all those concerned with the management of animals in the West Indies.

Barbados Donkeys.

The large donkey sire, El Rey, which the Governor-in-Executive Committee presented to the Barbados Agricultural Society, has been stationed at Long Bay Castle during the year where a number of the large jennie donkeys imported from the United States are kept, and where a number of foals have been borne to him.

The smaller donkey sire, Don Cavalero, which belongs to a syndicate of planters, has been on service in various districts of the island. As the foals from this latter animal have got more numerous it is difficult to keep an account of them, but it may be stated that they are gradually increasing in number, and soon some of them will be adding to the number of his descendants. In the near future the improvement in the breed of these animals should be noticeable.

Cows and Goats.

With regard to the twenty pure-bred Holstein cows and bulls, and the seven pure-bred Guernsey cows and bulls which were introduced in 1910 through the auspices of the Barbados Department, the same thing applies to these as applied in the case of the donkeys, viz: that their progeny have become so numerous now that it is impossible to obtain an accurate account of their numbers, etc.

As has been mentioned in previous reports, owing to the high infant mortailty amongst the infants of the peasants, five male goats presented to the Department by various gentlemen were stationed on service about the island for the purpose of improving the breed of the common goats in those districts.

Live Stock Trade of St. Vincent.

St Vincent has an important live stock export trade with the neighbouring islands, especially with St Lucia. The following table shows the number, kind and value of stock exported during 1914-15, for which the Government issued veterinary certificates, also the colonies to which the animals were exported:—

Class of animal.	Barbados, value.	Carriacou, value.	Grenada, value.	St. Lucia, value.	Trinidad, value.	Total value.
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Cattle	420 0			1,197 0	35 0	1,652 0
Horses	140 0	12 0	110 0		96 0	298 0
Mules						
Asses	80 0			3 0	276 0	359 0
Sheep	2 0			10 0		12 0
Goats	10					10
Pigs				6 0		6 0
Total	642 10	12 0	110 0	1,216 0	347 0	2,327 10

Berkshire and Tamworth Boars in the Virgin Islands.

These boars were imported into Tortola in 1913 with a view to improving the local breed of hogs, and during the

year under report their services were sought after in a manner which indicated that the peasantry appreciated the advantage offered. The boars were stationed in different parts of the Presidency, and were maintained in healthy condition throughout the year. It is known that over a hundred half breeds were raised in Tortola during 1914-15.

Plymouth Rock Fowls.

Through the kind assistance of the Imperial Commissioner of Agriculture, a trio of Plymouth Rock fowls was purchased and introduced at the Tortola Experiment Station during the year. The birds are fine specimens and won the 1st prize in the Agricultural and Industrial Exhibition at Barbados in December 1914. The hens have proved excellent layers, and a fair number of eggs for hatching were sold during the year, but some difficulty in raising the pure-bred chickens is being experienced.

Horses and Donkeys in St. Kitts and Anguilla.

The stallion imported from Jamaica into Anguilla by Mr. C. Rey, on which a bonus was paid by the Imperial Department of Agriculture, has done good service, and continues in good conditon.

In St. Kitts a bonus of £30 was paid to Dr. L. Shannon for the use of his thoroughbred stallion 'Tim Healy' on moderate terms for the space of three years. This arrangement has proved a great success and should result in the breeding of some very fine young horses in the near future.

The jack donkey imported by the local Government from Jamaica for improving the local breed of donkeys has been stationed at Mansion estate. This animal, although of first rate quality and well kept, has not been appreciated by the peasantry, even at the normal rate of the service fee.

Barbuda Stock Farm.

Barbuda is a small island managed by the Antigua Government. In addition to cotton cultivation a stock farm is maintained on which are raised horses, cattle and mules. In this connexion pastures are kept clear of bush, water-supply by means of wells provided, and paddocks and enclosures maintained, while two thoroughbred stallions and two jack donkeys are kept for service.

Apart from the stock owned by the Government, a large number of animals exist which are owned by the peasantry; these enjoy in return for the payment of a small annual license the use of the Government stallions, pastures, water-supply, and paddocks.

In addition to cotton cultivation, areas are each year planted by the Government under maize, Guinea corn, and other fodders, mainly for use as fodder for the stock.

Spraying for Ticks in Antigua.

In Volume XIV of the *West Indian Bulletin* there appeared an article written by Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, on Spraying for the Control of Ticks in Antigua, This article describes a spraying appliance for the control of these pests, the ordinary local method adopted for the control of ticks, and other information of interest.

The machine mentioned in the preceding paragraph was erected at Tomlinsons estate in 1913, and has proved efficacious. Information obtained from the Manager of this estate indicates that the spraying not only frees cattle from ticks, but when the cattle are regularly sprayed and pastured in isolated fields, the pastures are also cleared of these pests. Cattle newly introduced are sprayed every ten days; others every three weeks. The spraying solution used is Coopers' Cattle Dip.

As a direct consequence of the above, many estates in the island are subjecting their cattle to periodical sprays of the above solution. It is applied in various ways, in some cases being sprayed on the animals by means of a hand pump, and more recently a dipping tank has been erected on one estate. Particulars in connexion with this tank will be given in a subsequent report.

LIVE STOCK OBSERVATIONS IN ST. VINCENT.

The Government Veterinary Officer in St. Vincent, Mr. C P. Stoute, has recently made some observations on the value of dipping dogs for the eradication of fleas and mange. The dip used was the same strength as that used against ticks on cattle, namely 1 oz. of Coopers' Dip to 1 gallon of water. Mr. Stoute states that he has succeeded in getting several of the principal stock owners interested in the question of spraying cattle, and experiments with a spraying machine are being conducted on the estates.

Mr. Stoute has also been experimenting on the salting of pork. A pig weighing 118 lb. was killed and salted. This pig, locally bred barrow, razor back type, gave 87½ lb. of pork. The mixture used for salting was 8 lb. of common salt, 3 lb. of white sugar, 2 oz. of saltpetre. The finished product sold readily in St. Vincent. Apparently the only difference between this and the imported article is the thickness of the fat and the difference in the colour. The fat was not as plentiful, and the lean was redder than in the case of the imported pork.

Conservation of Soil Moisture in Sugar-cane Plantations.—The rainfall of Porto Rico is sufficient for the cultivation of sugar-cane, but its distribution during the year is sometimes unfavourable. Methods for the conservation of soil moisture are therefore very useful. The two practicable methods for this purpose are frequent weeding, and mulching with cane trash.

An experiment was carried out with three plots: one fallow, another mulched with a 6-inch layer of cane trash, and the third hoed to a depth of 2 or 3 inches once a week to represent shallow cultivation. At the end of the period September 8, 1914 to June 1, 1915, the percentages of humidity in the first 12 inches of soil were as follows:—

Plots.	Humidity.
1 Fallow	27·8
2 Trash mulch	31·9
3 Shallow cultivation	29·7

It is therefore evident that mulching is the most advantageous process, especially where the soil has not been hoed. It should be noted that the surplus in favour of mulching represents moisture which is all available to the plants. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for October 1915.)

MARKET REPORTS.

London.—The West India Committee Circular March 23, 1916.

Arrowroot—2½*d.* to 4½*d.*
Balata—Sheet, 3*s.* 1*d.*; block 2*s.* 7*d.*
Beeswax—No quotations.
Cacao—Trinidad, 89*s.* to 93*s.* 6*d*; Grenada, 81*s* to 87*s.*; Jamaica, 83*s.*
Coffee—Jamaica, 55*s.*
Copra—£37 5*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 13*d.* to 15½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 85/- to 100/-.
Isinglass—No quotations.
Honey—32*s.* to 43*s.*
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—11*d.* to 2*s.* 6*d.*
Nutmegs—8½*d.* to 1*s.*
Pimento—No quotations.
Rubber—Para, fine hard, 3/2; fine soft, 2/11½; Castilloa, quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 14, 1916.

Cacao—Caracas, 15⅝c. to 16c.; Grenada, 15½c. to 15¾c.; Trinidad, 15⅜c. to 16c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 55c.; Antigua and Barbados, 53c. to 55c.; St. Thomas and St. Kitts, 52c. to 54c. per lb.
Grape Fruit—Jamaica, $1·35 to $2·00.
Limes—$5·00 to $6·00.
Mace—38c. to 50c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·50 to $3·00.
Pimento—5¼c. to 5½c. per lb.
Sugar—Centrifugals, 96°, 6·02c;. Muscovados, 89°, 5·37c.; Molasses, 89°, 5·25c , all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., April 17, 1916.

Cacao—Venezuelan, $16·25 to $16·50; Trinidad, $15·00 to $15·25.
Coco-nut Oil—$1·15 per Imperial gallon.
Coffee—Venezuelan, 11c. to 12c.
Copra—$7·00 per 100 lb.
Dhal—$6·75 to $7·00.
Onions—$4·00 per 100 lb.
Peas, Split—$9·00 to $10·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., April 19, 1916; T. S. Garraway & Co., April 18, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$17·00 to $18·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $100·00 to $105 per ton.
Molasses—No quotations.
Onions—$7·00 to $7·50.
Peas, Split—$9·50 to $10·00 per 210 lb. Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·50 to $4·75 per 160 lb.
Rice—Ballam, $7·30 to 7·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·40 to $4·60.

British Guiana.—Messrs. Wieting & Richter, March 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker, & Co.
Arrowroot—St. Vincent	—	$14·50
Balata—Venezuela block	—	—
Demerara sheet	—	—
Cacao—Native	18c. per lb.	20c. per lb.
Cassava—		—
Cassava Starch—	$9·00	—
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9c. per lb.
Dhal—	$6·75 to $7·00	$7·25
Green Dhal	—	—
Eddoes—	$1·32	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	9c. to 14c.	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	—	—
Plantains—	24c. to 72c.	—
Potatoes—Nova Scotia	$4·50 to $5·00	$3·25 to $3·50
Lisbon	—	—
Potatoes—Sweet, B'bados	$1·80	—
Rice—Ballam	$6·00 to $6·50	—
Creole	—	$5·50
Tannias—	$2·88	—
Yams—White	—	—
Buck	$3·12	—
Sugar—Dark crystals	$3·75 to $4·15	$3·75
Yellow	$4·25 to $4·35	$4·25
White	—	—
Molasses	$3·10	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M	$4·00 to $6·00 per M.
,, Cordwood	$1·50 to $2·00 per ton	—

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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...OTANY, GOVERNMENT ...
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LAL-BAGH, BANGALORE.

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Progress and Changes.

WHEN the West Indian Royal Commission visited these colonies in 1897, the sugar industry of many of the islands involved the production of muscovado sugar. In British Guiana it is true that this form of industry had passed away and that it was passing in Trinidad, while in St. Lucia a relatively large proportion of the sugar turned out was made in vacuum pans. But in Barbados, Antigua, St. Kitts, Nevis, and Montserrat, sugar meant muscovado sugar, and when men spoke, as they did hourly, of the price of sugar, they implied, without qualification, the price of muscovado sugar, of 89° polariscopic test. To-day there is no market quotation for this class of sugar, and recent enquiry in Barbados, where there is an active local market far sugar, showed that the price for 89° muscovado sugar could only be arrived at by approximate calculation. The price of sugar, the matter of vital concern, now means instinctively the price of refiners' grey crystals of 96° polariscopic test.

This implies a far-reaching change and, while facts are fresh in men's minds, it may be well to make a retrospect so as to see what changes have taken place, and perhaps to look forward in anticipation of coming events.

It had long been recognized that the muscovado system of sugar manufacture was wasteful, and that the commodity produced possessed many disadvantages affecting the various operations through which it had to pass in storing, shipping and refining. It came to be recognized, too, that the profitable carrying on of the industry depended to a very great extent upon the ready sale at a remunerative price of the molasses produced as an integral part of the process. The demand for sugar was increasing but that for molasses was not keeping pace, so that while certain special, though limited, markets for it existed, there was little certainty as to the future of the demand.

West Indian sugar producers had long recognized these facts, and had seen that to ensure the stability of their industry they must give consideration to questions of improved methods of manufacture, implying the production of vacuum-pan sugars: but it at once became evident that these changes implied the introduction of specialized and costly machinery, the expense of which could not be borne by small plantations,

and this inevitably led to the consideration of the possibility of grouping estates so as to share the burden of the cost of the required machinery. So arose the long debated central factory problem.

How long this problem had been debated may be judged in some measure from the fact that in 1871 the Government of Antigua organized a visit of planters to the neighbouring island of Gaudeloupe in order to investigate the possibilities of the central factory system as exemplified by the Usine D'Arbusier then in full operation there. Experience of central factory debates leads one to draw the inference that a long period of discussion must have preceded definite action of this kind.

In the thirty years between 1871 and 1901, central factory discussions were a leading feature of the economic and political debates of many of the islands, particularly of Barbados and Antigua.

At the time of the visit of the Royal Commission above mentioned, there were eight factories in Barbados producing vacuum-pan sugar, one in Antigua, and one in St. Kitts. In Trinidad and St. Lucia the introduction of vacuum pans had gone relatively further. These factories may be regarded as the pioneers of the central factory movement, though they fulfilled few of the functions of a central factory as understood to-day. At that time the colonies recognized the pressing need of improved machinery involving the creation of central factories, but felt that the credit of the industry precluded their raising the necessary capital to effect the improvements they knew to be desirable.

Matters remained pretty much in this condition until it was found possible to stimulate the interest of capitalists by the offer of the Imperial Government, through the Government of Antigua, of financial assistance to encourage the erection of a pioneer factory in that Colony. This led to the creation of The Antigua Sugar Factory Company, and the erection of Gunthorpes factory, concerning which full particulars are available in these pages, and in the *West Indian Bulletin*.*

It was the intention of the Government that through the working of this factory information should be made available of such a character as would serve to guide the promoters of other similar efforts. This has been effected in a useful degree, the value of the information thus rendered available being enhanced by the fact that in the working of this factory due regard has been had to the scientific study of the various stages of sugar manufacture, unusual care being taken to make the work of the chemical laboratory, which is an integral part of the factory, full and accurate: the true functions of the chemist have been maintained as auditor in respect to the sugar passing through the factory, and as adviser of the management in respect to methods of working.

The working of this factory undoubtedly gave a great stimulus to the central factory movement; a factory capable of making some 9,000 tons of sugar was erected in St. Kitts in 1912, and a considerable number of small factories were erected in Barbados.

In Antigua and St. Kitts, the solution of the central factory problem has been along the line of large factories, not in themselves connected with any area growing canes, but obtaining their cane supply under contracts made with cane growers, that is to say, with estates, whereby the estates undertake to cultivate stated areas in sugar-canes and to send these canes to the factory, payment being made on a profit-sharing plan.

In Barbados, on the other hand, there has been some disinclination on the part of land owners to enter into agreements binding upon them for a number of years to furnish canes for factories and, as a consequence, the factory problem has been solved there along the lines of comparatively small factories on estates which themselves produce the supply of cane essential to the factory's working: as a natural outcome of this position there has grown up an extensive system of buying canes from surrounding cultivators under very short term agreements, where the independence of each party is preserved. The cultivator sells his canes to the factory or himself makes them into sugar, or syrup, as he thinks will prove most remunerative at the moment. The factory, on the other hand, accepts or declines canes from week to week as the owner thinks fit, or as he can arrange with the grower.

At present there are some nineteen factories in Barbados making vacuum-pan sugar, some of them capable of making up to 4,000 tons in a season, others making under 1,000 tons.

It would seem that the point now to be settled is the best size to be adopted for factories in the several islands, and to learn whether small factories can be worked so well and economically as to compete in cost of production with large ones.

**Agricultural News*, V, 49: X, 3: XI, 163: XIV, 388. *West Indian Bulletin*, VI, 60: IX, 79; XIV, 47.

Two factors appear to have an important bearing on this aspect of the question. Where transportation is difficult, there will be a tendency to limit the size of the factory; where large areas are easily tapped, there will be a disposition to put up large factories. The other factor, which is only just beginning to be appreciated, is the kind of plant to be used, as affected by the character of the cane to be handled. Where the canes to be dealt with contain but little fibre, it is possible to deal efficiently with them in comparatively small and simple mills: but where the canes contain large quantities of fibre, as do those in Antigua, it is found requisite to employ heavy multiple mills and heavy maceration in order to extract the sugar from the cane effectively.

In the early stages of central factory discussions attention was largely centred upon the type of sugar to be made, and the vacuum pan was the apparatus largely thought of. Experience has shown that the mills are the dominant factor. In the early stages of factory development a set of mills having three rollers was deemed sufficient, and efforts were directed to making this appliance as strong as possible: it soon began to be seen, however, that efficient work was only to be done by submitting the cane to repeated crushings; developments, therefore, took place along the line of multiplying the number of rollers in the train of mills, and of spraying water upon megass in its passage through them.

Few factories, even amongst the small ones in Barbados, are now worked with three-roller mills, and even where they still exist steps are being taken to replace them with mills having six or more rollers, as soon as possible. The factories referred to in Antigua and St. Kitts each have trains of mills containing fourteen rollers.

Another feature is worth commenting on. In the system which has found acceptance in Antigua and St. Kitts, the factories are disconnected from the work of cane growing and obtain their supplies of canes entirely from growers who sell to the factory. In Barbados, on the other hand, the factories are operated by owners who are cane growers, and who only buy a portion of their cane supply from outside growers.

One effect of the system obtaining in Antigua and St. Kitts is that the integrity of the estates is preserved: there is no tendency on the part of the factory to absorb them. It is immaterial whether an estate contracting to supply canes is large or small, it stands in the same relation to the factory. This will have the effect of preserving the smaller estate owner, and gives full scope for the development of a resident proprietary body possessed of estates of moderate size, which can be worked to advantage by the resident owner himself.

Under the system obtaining in Barbados the owner of the factory feels hampered by the uncertainty of the cane supply, and in order to make it safer will be inclined to increase the area of production over which he has control; consequently he will be disposed to acquire such adjacent properties as may come within his reach, and the natural outcome of the system will be the development of large estates by the assimilation of the smaller ones. This process may be slow, but it is likely to be steady and certain in its operation for, under this system, there will be no motive for again dividing into small areas of production. So we have the anomaly of the conservative small estate owner, anxious to preserve his independence of action and to that end declining to bind himself by contracts to supply canes to a factory, defeating his own object by creating a position which has, as a natural tendency, his absorption into a larger scheme.

No opinion is expressed as to the ultimate effect on the community of either line of development. Doubtless each will be found to possess advantages.

A copy has just been received of the Royal Colonial Institute Year-book for 1915. In addition to the information embodied in the edition for 1914 it contains statistical information regarding all parts of the Empire, as well as a classified list of the newspapers and magazines which are to be seen in the Institute Building. The list of fellows grew considerably during 1915. Next year it is expected that there will be a record increase as a result of the active measures the Institute is now taking to achieve full representation of all the Colonies and Dominions. The fellows of the Royal Colonial Institute may in the future form the basis of a constituency for the election of an Imperial Parliament.

Visits have been made recently by the Curator at Tortola to out-districts, and meetings have been held. These have been principally in connexion with the development of the onion industry. As regards the weather experienced, it is stated that during January and the first part of February, the weather was showery, but since then, the prevailing conditions have been dry.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore, the Superintendent of Agriculture, writes to say that there has been further planting of Lima beans at the St. Cyr Experiment Station and promising growth has been made. In the Botanic Gardens, the new ferro-concrete nursery shade and fence has been completed and has proved satisfactory. It was expected that a meeting of the Board of Agriculture would be held shortly in the Botanic Gardens, thereby providing an opportunity for the members to observe collectively recent improvements and extension of work. Considerable attention has been given recently in Grenada to the cacao prize holdings competition for which entries are now being received. The new rules, noted elsewhere in this Journal, are stated to be more popular than the former ones were. As regards markets, nutmegs were fetching remunerative prices, namely, £5 to £6 per barrel at estate boucan.

ST. VINCENT. Work in the Experiment Station has consisted recently in the reaping of selected corn, laying out a new series of arrowroot experiments to determine (1) the effect on yield from feeding the arrowroot worm (*Calpodes ethlius*), and (2) the manurial value of Madura prunings (*Gliricidia maculata*). As well as this, 1,500 imported cane plants were inspected. As regards special work by the officers of the Agricultural Department, Mr. W. N. Sands says that investigations were continued in connexion with the native food plants of the cotton stainer. Planters have been warned of the danger of allowing 'silk cotton' and 'John Bull' trees (*Thespesia populnea*) to remain on their lands, since these are a source of food for the cotton stainers during the close season. On several estates active measures have already been taken to remove these trees in order to keep down the stainers which, as is well known, are responsible for very considerable losses in connexion with St. Vincent cotton. The Assistant Agricultural Superintendent has devoted attention to the hybridization of the F1 corn hybrids of American varieties by native yellow, and to the selection of bush Lima beans of the F1 generation. A large number of cotton growers from the South Grenadines were met at the St. Vincent Government Ginnery, and questions connected with cotton, such as seed for planting, meal and manure, were discussed with them. As stated in previous notes of departmental interest, the Agricultural Superintendent has now taken over the supervision of the Government Cotton Ginnery. At the time of writing a coming event of interest was the holding of meetings in out-districts to advise small growers as to the planting of crops for the coming season. Observations relating to staple crops showed the weather was favourable to the reaping of canes arrowroot and peas crops. The crop of pigeon peas, which was larger than usual, met with a ready sale at remunerative prices in intercolonial markets. An extension of cane and arrowroot planting was to be noted. The rainfall during April was seasonable.

ST. LUCIA. Mr. A. J. Brooks, the Agricultural Superintendent, states that during March cacao was being reaped and the lime crop was flowering. Harvesting of the cane crop was in full swing; rain somewhat interfered with operations. In the Experiment Station, work consisted in reaping canes and manufacturing sugar, sowing Robusta coffee, transplanting limes, budding oranges, potting ornamental plants. Several improvements are in progress in the Botanic Gardens, including road making and the raising of lawns.

DOMINICA. Mr. Joseph Jones writes to say that the usual routine work has been in progress in the lime and cacao experiment stations, while in the Botanic Gardens various repairs have been effected. Concerning the condition of the staple crops, there was no special change to record at the time of writing. It may be mentioned, however, that owing to lack of shipping facilities, the green lime trade is likely to suffer considerably. A considerable portion of one shipment was left behind. Mr. Jones states that the economic collection in the Victoria Museum has been gone through, and several specimens renewed and a large number relabelled. Experiments on the concentration of lime juice by freezing has been brought to a close, and an account of this investigation will appear in the forthcoming Annual Report for 1915-16. As regards agricultural education, the pupils at the station received attention in both field and class work. They left for their Easter vacation on April 19 and returned on May 1. During April the weather was dry. The plants distributed consisted of limes 200, shade trees 100, budded citrus 9, miscellaneous 3, giving a total of 312.

ST KITTS. Every effort, writes Mr. F. R. Shepherd, is being made to take off the old cane crop as quickly as possible. The Basseterre factory is doing good work, having one week made 600 tons of sugar. The muscovado estates, it is said, are hampered as they cannot get their sugar shipped. Large stocks are on hand. The young cane crop is looking well but rain is much needed especially in the valley district. As regards cotton, many fields have been planted in the northern districts and the young plants are looking well. The estates in the valley district are preparing to plant with the first rains. Mr. Shepherd says it seems likely that the acreage under cotton will be greatly increased this season. He accompanied the Administrator to Nevis during April, and a meeting was held with the object of encouraging cotton growing. An account of this meeting is given on another page in this issue. With a similar object Mr. Shepherd visited Anguilla. In the experiment station, the principal work has been reaping the experiment plots and testing the sugar-cane varieties grown thereon. From the station 1,200 sweet potato cuttings were distributed during the month, together with 9lb. of beans. The rainfall during the month has been rather meagre.

NEVIS. The cane crop appears to be promising except in some places where it has felt the dry weather. Reaping of the crop is still in progress and the returns are good. A part of the crop is being sold to the St. Kitts factory and a part made into sugar, but there is some difficulty in getting the sugar shipped. As regards cotton, the land is being prepared for planting but little has yet been sown. As in St. Kitts, there is likely to be a fair acreage put into cultivation this season. It is to be regretted that old cotton is still seen standing about in many fields. Internal boll disease has been found in some fields and stainers are fairly plentiful. Rainfall during the month was moderate. The report of the Agricultural Instructor for the quarter ending March 31 contains the results of last season's manurial experiments with cotton. It appears that organic manures have exerted a very considerable stimulating effect, giving increased yields. The onion industry in Nevis is increasing satisfactorily. During the quarter 2,014 lb. of onions were sold in the local market, and some were sent to Barbados. Attention has been given to the selection of cotton, and to the cultivation of beans and peas.

TORTOLA. According to Mr. Fishlock's report, dated April 11, 1916, the sugar crop in Tortola will be larger than was at one time expected. The lime and cotton crops will also exceed expectations. In the case of onions, already more

than twice the total quantity shipped last year has been exported. The agricultural prospects this year in the Virgin Islands are therefore good. There was a committee meeting of the Tortola Onion Growers' Associat on during March. The weather during the month was dry, rain in measurable quantity falling on nine days of the month, the total amount recorded being 1·84 inches, as compared with an ave age of 2·51 for the same month for the previous fifteen years.

ENCOURAGEMENT OF COTTON CULTIVATION IN NEVIS.

His Honour Major Burdon, C.M.G., Administrator of St. Kitts-Nevis, accompanied by Mr. F. R. Shepherd, Agricultural Superintendent, recently paid a visit to Nevis with the object of holding a meeting for the purpose of encouraging peasant cotton growing in that island. In response to a circular letter previously issued by the Administrator, there was a large and representative assemblage. After a few introductory remarks the Administrator requested Mr. Shepherd to review the condition of the cotton industry in Nevis in recent years, with special reference to the small growers. In doing so Mr. Shepherd referred first to the satisfactory working a few years ago of the ginneries formerly at Stony Grove, which had been managed by Mrs. Mills. By this means the small grower could have his cotton ginned and shipped, and an advance of money to aid him until the cotton was sold. This ginnery, unfortunately, was destroyed by fire some years ago, and has not yet been replaced.

Continuing, Mr. Shepherd said the season of 1914 had been a favourable one from the point of view of production, but the war had upset market arrangements, so that the small grower had had difficulty in selling his seed-cotton locally, and had been ultimately obliged to accept whatever price had been offered by local speculators. This led last year to a reduction in acreage. The Agricultural Department, however, made every effort to arrange a scheme for the purchase of peasant cotton, and the one eventually arrived at was that operated by Mrs. Pistana, a purchaser of seed-cotton in St. Kitts. By this scheme a first payment of 5c. per lb. of seed-cotton was secured for the grower, and a share in the profits after the cotton was sold. Mr. Shepherd said that during the coming season the same purchaser would be willing to continue the agreement, the question of the price for first payment to be fixed according to the market price of lint cotton. Mr. Shepherd commended this arrangement and urged on all present the advisability of increasing the acreage planted in Nevis during the coming season, as there was every prospect of better prices for cotton in the near future.

Considerable discussion then took place and there appeared to be some feeling that it would be preferable if, instead of the buyer being resident in St. Kitts, the same terms could be offered by someone resident in Nevis. Mr. Shepherd explained that he held no brief for any particular purchaser, and that it was open to anyone in Nevis to make similar terms. The Rev. Coward suggested for the consideration of the meeting, that the ginnery in Charlestown, at present lying idle, should be acquired either by the Government or by a local syndicate, and the cotton purchased on a sliding scale basis similar to that adopted with canes at the Basseterre Sugar Factory. A bonus would also be declared on the profits of the working of the business. Mr. W. P. Maynard advocated that cotton should be purchased at a price fixed by the Government. Hon. J. S. Hollings, as agent of Messrs. Gillespie Bros., Ltd., said he was prepared to receive any quantity of cotton, whether it was 1 bale or 1,000 bales, and make an advance upon it and then sell it. After the cotton is sold a small commission would be charged, and the total proceeds, less the actual expenses and commission, would be handed to the growers.

In commenting upon the above observations, Mr. Shepherd said he was of opinion that the result of the meeting was to show that the position of the cotton industry in Nevis was satisfactory. Under Mr. Hollings' arrangements the grower of 1 bale and upwards could find an easy market with an advance as first payment, and the small grower who could not avail himself of this could find a safe market for his seed-cotton either under Mrs. Pistana's scheme, or through a local purchaser in Nevis, of whom there appeared to be several willing to come forward.

In closing the meeting, His Honour the Administrator thanked everyone for coming and for making the meeting interesting and useful. He mentioned that the advisability of a small export tax on cotton lint was under consideration, and that he was consulting Dr Watts, the Imperial Commissioner of Agriculture, on the subject.

A COTTON GROWERS' ASSOCIATION IN ANTIGUA.

As an outcome of the recent Cotton Conference held in St. Kitts, an association of cotton growers has been formed in Antigua The Association includes in its membership all the principal cotton growers in the island. The committee of management consists of the following gentlemen: Mr. A. P. Cowley (Chairman), Hon. R. Warneford, Dr. H. A. Tempany (ex officio), Captain J. Dew, Mr. M. Scott Johnstone, and Mr. T. Jackson (Curator, Experiment Station) to be Secretary and Treasurer.

Mr. Jackson has forwarded to this Office the rules of the Association, which may serve as a model for other islands where, no doubt, similar associations will be formed. These rules are brief, and provide firstly, that the object of the association shall be to safeguard the interests, and to promote the development of the cotton industry in Antigua. Secondly, the persons eligible for membership must be cultivators of cotton or engaged in handling and marketing the crop, or interested in the industry in other ways. Thirdly, the Association is to be affiliated to the Antigua Agricultural and Commercial Society and to the Antigua Onion Growers' Association, but membership of the association shall not necessitate membership of either or both of these bodies, nor does the affiliation imply any financial responsibility. Ordinary members are to be elected annually at the general meeting on the proposition of two members. This general meeting will be held in April, when officers will also be elected. A special meeting may be summoned at any time at the discretion of the Board of Management, or on the written requisition of three members. At meetings of the committee three shall form a quorum; at any general meeting seven shall form a quorum. The subscription to the Association is 1*s.* 6*d.* per annum, payable annually.

The rules stipulate that the Committee of Management shall hold meetings and shall have full power to deal with all matters affecting the interest of the industry in Antigua. The Association shall co-operate with planters, and with the Agricultural Department in conducting experiments and trials likely to be of value to the industry. The results shall be communicated to the members. If desirable, the rules may be amended at a general meeting of the Association, members having been previously informed of the proposed alterations. Lastly, the rules make provision for the expulsion of any undesirable member by vote taken in general meeting.

COTTON CONFERENCE.

THIRD DAY'S PROCEEDINGS.

In the last two issues of the *Agricultural News* have appeared summarized accounts of the proceedings of the second day of the Conference. On the third day, the President suggested that the question of methods to be employed in ascertaining the characters of cotton should be discussed, with a view to ascertaining what methods are best for general adoption for seed selection and seed supply. He pointed out that there were two sides to be considered: the scientific research side, and the experiment station side. On the one hand, laboratory details had to be considered; and on the other, practical field work. As a means of starting a discussion the President asked Mr. Harland (St. Vincent) to read a paper entitled, Some Lint Characters of Sea Island Cotton. In this the reader stated that the most important lint characters were length, strength and fineness, and, in respect of these three characters, uniformity. It was also desirable to have other properties such as a low percentage of weak fibre, a large weight of lint per seed, a good amount of twist, etc., but it was thought that workers in the West Indies for the present should confine their attention in selection work to the first four characters mentioned.

As regards length or rather its determination, Mr. Harland stated that mean maximum length of the fibre is known to be a hereditary character, which is subject to environmental modification, and in a pure strain to fluctuation. As a result of experiments, Mr. Harland had found that for the determination of the mean maximum lint length, it was sufficient to measure the length on five seeds to give a result which is fairly accurate for purposes of comparison. Uniformity of length was next dealt with. It was considered that the only accurate way of estimating uniformity of length was to pull out all the fibres of, say, over 40 mm. from the combed seed, weigh this as available fibre, and express it as a percentage of the total fibre. Different standards would be adopted according to the cottons dealt with. Mr. Harland's results showed that in comparing the percentage of available fibre from different Sea Island cottons, it was ordinarily sufficient to take the mean of ten seeds. In regard to weak fibre, it was pointed out that easily separable lint did not necessarily imply a large proportion of weak and immature fibre. Considering that the estimation of available fibre would provide more valuable data and could be done, using only ten seeds, it would probably be wise to do away with weak fibre determinations altogether. It was however just as difficult to estimate available fibre as it was weak fibre in plants with easily separable lint, and this difficulty could only be got over by selecting plants with lint that were difficultly separable from the seed.

Mr. Harland then pointed out that his observations did not agree with the statement of Cook in America, that continuous selection for high lint percentage was inadvisable on the ground that a high lint percentage usually implied a light seed, and light seeds being small seeds would give rise to plants which were lacking in vigour. Mr. Harland gave figures to show that if plants with high lint percentage were selected, their seed weight was, as a rule, quite normal. The speaker had not found that plants with a low seed weight gave rise to progeny deficient in vigour. He had found that vigour was dependent more upon the specific gravity of the seeds than on their actual weight. He had found that seeds of high specific gravity germinated quicker and better than those of low specific gravity, and gave a much better stand. The speaker had also found that a correlation existed between lint index and lint percentage. In selecting cottons a high lint index was desirable, but care had to be exercised in doing so, as there was some danger that selection for lint index alone would introduce the coarse fibre, which was associated with high lint index in some of the American cottons.

Mr. Harland also read a second paper on the diameter of cotton fibres, with some notes on their breaking points. This paper dealt with the best methods of measuring the diameter of cotton fibres. It was concluded that it is unnecessary to determine the diameter of single fibres, and that all work should be done by cross-sections of a bundle of fibres embedded in some material like celloidin. In connexion with the breaking points of fibre, Mr. Harland described an appliance which his collaborator (Mr. F. W. L'Anson, M.A., B Sc.,) had devised for the purpose.

At the conclusion of the reading of these papers the President said the general conclusions appeared to be that the most experiment station workers can do at present in the West Indies is to determine mean maximum length, uniformity of length, and lint index.

Mr. A. O. Thurston asked whether it was possible to define the difference between immature cotton and ripe cotton.

The President in reply, stated that that information could be obtained from Balls' book, 'The Development and Properties of Raw Cotton'. The great point was, he said, that strength did not appear in cotton until the twenty-first day after the flower opened, and then it went on increasing from the twenty-first to the forty-second day. Thus, if cotton were picked before the twenty-first day, it would be very weak. The maximum strength was attained in about forty five days from the opening of the corolla.

In connexion with the correct time for picking, Mr. Hollings (Nevis) stated that he had received a specification of a patent whereby the bolls could be picked before they opened, and opened afterwards by chemical means. Such cotton was stated to be cleaner, stronger and better in every respect than if it were allowed to ripen and open in the usual way.

Dr. Tempany (Antigua) then read a short note on twist in relation to fineness in Sea Island cotton. In cottons, he said, the classes of fibres which are encountered may be divided under three heads: regularly twisted fibres, irregularly twisted fibres, and fibres with very little, if any, twist. He had found that in coarse, or relatively coarse, cottons, the proportion of regularly twisted fibre was higher than in those of the finest type. He pointed out that Balls had shown that fineness was probably a function of the thickness of the cell wall of the fibre, while twist was due to the presence in the cell wall of transversely placed pits, which as the fibre dried caused the twist in question. The thinner the cell wall the more shallow would be the pit, and in consequence, the smaller the twisting force. Irregularly twisted fibres were finest, and the proportion of irregularly twisted fibre within limits prescribed by the original diameter of the uncollapsed fibres would serve as a direct measure of the fineness. It was characteristic of the fine cottons that they contained a high proportion of irregularly twisted fibre, as had been shown.

Dr. Tempany then reverted to a point raised by Mr Harland, namely, the measurement of lint lengths. In the Leeward Islands it has been the habit to measure cotton by pulling the cotton lint from the seed, laying it out on a baize-covered base board, and measuring the two longest pulls. Balls in his book had suggested that in preference to pulling, the fibre should be combed out into the form of a halo. This method had been tried in Antigua, and

t had been found that by the halo method the average engths were 2 mm. shorter in every case than the pulling methods, a point which can be allowed for. The halo method was much more rapid than the pulling method. In combing, more fibre is removed from the seed than one s warranted in regarding as waste. The difficulty had been got over by holding the seed by the lint, and in that way the weak fibre was broken and was not merely pulled from the seed. This latter method made a very considerable difference in the determination: it worked out something like 50 per cent.

The President pointed out that Balls' method lost sight of the variation that might occur as the result of short fibres. Balls' method might be advisable for Egyptian cotton, but some explanation is wanted as regards its applicability for Sea Island cotton. In practical experiment station work he thought the only three things that it was necessary to do in selecting types of cotton for pure strains were, the determination of length, the method of doing which they had just discussed,—the amount of available fibre, and the lint index. After referring to the correlation that occurs between lint index and lint percentage, he called attention to the question of strength. When the spinner referred to strength, the idea of real breaking strain was not involved. Strength from the spinner's point of view was not the break itself but the manner of the break. Then there was another point, namely the difference between the strength of the individual cotton fibre and the strength of one yarn spun from it, each being of an entirely different nature. If cotton spun well it would be good cotton, if it did not spin well it would be bad cotton. Similarly, when the spinner talked about fineness, he did not mean fineness in the ordinary sense of the term, he meant cotton that would spin fine yarn.

As a result of a question put by Mr. Maloney (Nevis), the President pointed out that a cotton fibre is seldom broken in pulling. The tensile strength of cotton is greater than the tensile strength of steel. When yarn is broken, what happens is that the fibres lose their grip and are pulled away from each other. He then asked whether, in addition to the determinations that had been decided were necessary and desirable, anyone present wished to suggest any additional ones.

Mr. Jackson (Antigua) asked whether it would be possible to add spinning tests. This was discussed later. Dr. Tempany suggested that it would be unwise to discard the broker's finger test which had been used in the Leeward Islands, and with success. Hon. J. S. Hollings then made observations concerning lack of uniformity of twist causing unequal distribution of strain. The President thought it would be a wise decision to continue to employ the broker's finger test as suggested by Dr. Tempany. Mr. S. C. Harland (St. Vincent) said, provided the selected cottons were also subjected to spinning tests, he agreed with the suggestion. But he thought it would be very unwise to reject pure selections which had been spun and produced superior yarns of cotton that were already graded as good. In this connexion reference was made to Balls' remarks on 'ugliness' in samples of cotton. There appeared to be considerable danger that good cotton might be underestimated by the grader through too much weight being given to 'associative' features.

The Hon. R. L. Warneford (Antigua) asked whether cotton was judged and sold by the final spinner's test or the finger test. In answer, the President said it was sold practically on the finger test, but there was reason to believe that cotton bought by the spinners did not always come up to their expectations in spinning. The reverse might also occur. The President thought that it was extremely necessary to introduce spinning tests. It appeared that model machinery of a laboratory type could not be devised for testing the spinning value of cotton. The spinning could only be done satisfactorily on a large scale, and experiments in a mill were difficult to perform owing to interruption in working being very inconvenient. The spinners, moreover, had not yet appeared to realize the need for spinning tests, and were not over sympathetic towards them. But, largely through the influence of Mr. J. McConnel, he thought that this would change: in fact it was obvious that the spinners were coming round to the scientific aspect of things, as was indicated by their having secured the services of Mr. Balls as adviser.

The President said he thought it would be useful if the spinners would furnish him, as Comissioner of Agriculture, with information as to the results of spinning difference marks of cotton sent from the West Indies. Mr. S. W. Howes (Montserrat) said he was sure the majority of planters would appreciate such action very much. The President then proposed that, as a result of the discussion, he, speaking on behalf of cotton growers, should make representation to the British Cotton Growing Association that they should aproach the Fine Spinners and endeavour to learn from them detailed information as to the behaviour in the mills of the particular marks, and forward this to the Commissioner of Agriculture. This information would be regarded as strictly confidential, and would be communicated to the grower of the particular cotton about which information had been obtained.

The Resolution was put formally, and the Conference signified unanimous assent.

(*To be continued.*)

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 17, 1916, with reference to the sales of West Indian Sea Island cotton:—

Owing to larger arrivals there has been a better business in West Indian Sea Island cotton since our last report. The sales amount to about 330 bales, and are comprised of Nevis 14*d.* to 16*d.*, St. Kitts 16*d.* to 20*d.*, St. Vincent 20*d.* to 23*d.*, Jamaica 13*d.*, and Stains from 7*d.* to 12*d.*

The market is firm, but owing to the limited demand for luxuries, there is very little enquiry for yarn made from this class of cotton, and the spinners who are purchasing are putting it away, mostly for twelve months.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 15, 1916, is as follows:—

ISLANDS. As the crop has been entirely disposed of, there being no unsold stock either here or on plantation, this market is closed until the next season. The quotations are only nominal, but represent the closing prices paid.

We quote, viz.:

Extra Fine	31c. = 20½*d.*	c.i.f. & 5 per cent.
Fully Fine	30c. = 20*d.*	,, ,, ,, ,,
Fine	29c. = 19½*d.*	,, ,, ,, ,,
Fine off in class	28c. = 19*d.*	,, ,, ,, ,,

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester up to April 15, 1916, were 658 and 443 bales, respectively.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

Imperial Commissioner of Agriculture for the West Indies — Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number concerns progress and changes in the West Indian sugar world during the last ten years.

On page 166, the account of the proceedings of the recent Cotton Conference is continued from our last issue. The present account has regard to the third day's proceedings, which will be continued in the next issue.

An interesting note on degerminated corn meal will be found on page 171.

Insect Notes in this issue deal with insects attacking onions, being a continuation of the notes on the same subject in the last issue. Under Plant Diseases will be found a useful article on pine-apple wilt.

'West Indian Bulletin', Vol. XV, No. 3.

Number 3 of Volume XV of the *West Indian Bulletin* has recently been issued. Amongst the important matters dealt with therein are two interesting studies in insect parasitism. The first of these, by Mr. W. Nowell, D.I.C., Mycologist on the Staff of this Department, describes two Scoliid parasites, on Scarabaeid or hard back larvae in Barbados, namely *Tiphia parallela*, Smith, and *Campsomeris* (Dielis) *dorsata*. Fab., the investigations described having been carried out in connexion with the Barbados Department of Agriculture. The second is by Mr. S. C. Harland, B.Sc., Assistant Agricultural Superintendent, St. Vincent, and comprises notes on *Trichogramma minutum* (Pretiosa), the egg parasite of the lesser moth borer of sugar-cane (*Diatraea saccharalis*, Fab.). In addition to these, is a useful paper on legislating against plant diseases by Dr. Francis Watts, C.M.G. Bay oil and the cultivation of the Bay tree as a crop plant, is fully discussed in a paper by Dr. H. A. Tempany and Mr. W. Robson. This is probably the first comprehensive discussion of the Bay tree as a crop plant yet published. Following this is a valuable statistical article on the development of Dominica by Dr. Watts, showing the steady and important progress manifested in the agricultural development of the Colony during a period of twenty-three years (1892-1914). Not the least useful contribution is a summary of the manurial experiments with sugar-cane in the West Indies, with which this number of the *Bulletin* concludes, by Mr. W. R. Dunlop, Scientific Assistant to the Department, dating back from 1891 to the present time, with an important final note on the precision of West Indian methods.

This constitutes a very interesting number of Volume XV.

Close Season Ordinance in Montserrat.

In the *Leeward Islands Gazette* for January 13, is a Proclamation by the Government fixing the close season during which no cotton has been planted in Montserrat. This was from September 1, 1915, to March 15, 1916. All cotton plants planted before the month of September 1915 had to be destroyed by being pulled up out of the soil, and every part completely burnt on or before the last day of January 1916.

This Proclamation is of interest in connexion with the discussions concerning the control of the cotton stainer and internal boll disease that took place at the recent Conference, and which will appear in a summarised form in the next issue of the *Agricultural News*. There can be no doubt that a close season is desirable in most islands. It is important to bear in mind that the Ordinance makes provision for suspending or changing the dates from year to year, according to the time that cotton has been sown, and according to weather conditions. Hence the Ordinance is an adjustable one, and in that respect is to be regarded as a most satisfactory piece of legislation.

Cotton in Brazil.

The State of Parahyba is the largest producer of cotton in Brazil. The cultivated cotton may be divided into two groups: (1) seeds covered with a white, yellowish or green down (*Gossypium herbaceum* and *G. hirsutum*, or Upland types); (2) seeds glabrous, united as in creole cotton (*G. peruvianum*), or free as in cottons of the Sea Island type. The length of fibres in Brazilian cotton varies from 25 to 41 mm., and the average yield is as follows: white herbaceous, ginning percentage 29, creole 23, Seda 30, Caravonica 46·5.

In 1912 the State of Parahyba exported 20,000,000 kilograms of cotton worth £1,344,000, the amount of the export having doubled in ten years. Further details concerning Brazilian cotton may be obtained by reference to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for December 1915.

Ensilage Tanks.

The subject of handling silage is dealt with in Bulletin No. 145 of the Agricultural Experiment Station of Nebraska. Ensilage pits or tanks are now being installed in the West Indies, in Antigua, so that the Bulletin under review will no doubt be found of interest by many planters. In preparing material for silage it is usual to cut it up. In America it is now a common practice for farmers to buy a 12- or 14-inch cutter, co-operatively, and use it on five or six jobs per season. Such an outfit has a capacity of 8 or 10 tons per hour. The bulletin under consideration is well illustrated and shows the various devices employed. Of special interest in the West Indies will be the description of hand hoists, and of a home-made hoisting device for semi-pit silos. All those who are entertaining the idea of manufacturing silage should give this bulletin their careful consideration.

The British Guiana Industrial School.

Some useful and interesting work is reported on in a recent publication as having been carried out on the farm at the Onderneeming Industrial School in Demerara. Experiments with various economic plants including cacao, coffee, limes, and rubber have been arranged by the Department of Agriculture and carried out at the School under the general direction of that Department. Reference may be made first to the manurial experiments with cacao which were reported on in the last issue of this Journal. Lime cultivation at the School is receiving particular attention, in view of the fact that a properly equipped factory, similar to that in St. Lucia, is being erected for the proper concentration of lime juice. It is expected that this factory will cost about $3,000. Concerning rubber, the experimental tapping of 200 Heveas, of an average age of seven years, is now being carried out, and the yield of dry rubber so far works out at an average of a little over 3 lb. per tree per annum, while there is a distinct upward tendency. Lastly, in connexion with this Farm School, we may refer to the satisfactory condition of the Stock Farm which contains a Short horn and a Guernsey bull, a Southdown ram and a large amount of feathered stock. The stock farm is not only useful and instructive in the matter of raising high bred animals, but it pays for itself. Thus the accounts of the animal stock farm show the gross expenditure for the nine months with which the report deals, namely, April to December 1915, to have been $818, while the revenue was $1,016, giving a net profit of $150.

Pork and Bacon Investigations.

The continued high price of pig products renders the question of increased production within the West Indies of importance. A Bulletin (No. 283), issued by the Ohio Agricultural Experiment Station, calls to mind the suggestion to use sugar factory scum cake as food for pigs. In feeding experiments in Ohio it has been found that corn supplemented by soy beans, linseed oil meal, wheat middlings, tankage and skim, milk in proportion such that the nutritive ratios of the rations are as 1: 6·5, does not furnish mineral matter of the amount and kind requisite to maximum growth of bones. Scum cake, however, contains a large amount of calcium phosphate, and for this reason it might constitute a most important supplementary foodstuff for pigs.

Results of considerable interest are contained in the Report of the Chief of the United States Bureau of Animal Industry for the year ended June 30, 1916. For several years an attempt has been made in America to find an antidote for cotton seed meal poisoning. Sulphate of iron and other mineral substances have been tried, and although it has been found possible to reduce somewhat the danger of poisoning by the use of the iron salt, this substance is not an absolute preventive. In the West Indies it would be very useful if an antidote could be found, in order that in the islands where cotton is grown, the meal might be used as a food for pigs.

In the same report two experiments are described, the object of which was to study the effect of replacing corn in a ration with desiccated sweet potatoes. The results have indicated that sweet potatoes in the dried form are too bulky for hogs, and that the animals cannot consume a sufficient quantity to lay on good gains. Another experiment showed that fish meal forms a very effective supplement in a grain ration for pigs. It was found equal, if not superior, to tankage.

Lastly; the United States Department of Agriculture has plans in progress for the study of the effect of feeding forage crops on the quality of pork.

A large amount of information is available concerning the profitable feeding of pigs, and those interested in the subject should give the matter full attention, particularly as regards the proper balance of rations, and the effect of different substances upon the composition and consistency of the meat.

INSECT NOTES.

INSECT ATTACKING ONIONS.

(Concluded.)

THE BROWN HARD BACK (*Lachnosterna* sp.).

The grubs of the brown hard back have come to be recognized in Antigua as causing serious injury to certain crops. Sugar-cane, Indian corn, onions and sweet potatoes are all attacked. These grubs feed upon the young tender roots of growing plants, and they also devour the young developing bulbs of the onion, eat into the cut ends and buds of cane cuttings used as plants, and eat into the potato roots.

In one instance in Antigua, hard back grubs attacked and completely destroyed a field of 7 acres of onions, at a time when the bulbs were just forming.

The remedies to be employed for the control of the hard back grub have frequently been mentioned in recent numbers of the *Agricultural News*. They consist in hand-picking, the use of trap crops, and improved cultivation. As onions are grown as a secondary crop in Antigua, the improved cultivation would be carried out as a part of the routine work in connexion with the sugar-cane.

In considering the course to pursue in preparing land for onions, the following points should be borne in mind: (1) land known to be badly infested with grubs should not be planted in onions; (2) preparation of the soil should be thorough, and any grubs found should be carefully collected and destroyed; and (3) a trap crop of corn might be planted after the land has been prepared. This could be pulled up when the time came for transplanting the onions, and the soil about the roots carefully searched for grubs. By attention to these points it ought to be possible to escape serious injury to onions by this pest.

THE ONION CATERPILLAR (*Prodenia* sp.).

Onions are attacked at times in the West Indies by one or more kinds of caterpillar or cut-worm. They are the larvae of moths of the genus Prodenia. They live in the ground and often cut off young seedlings at the surface of the ground. In the case of onions, the caterpillars climb up at night and feed upon the leaves, sometimes eating through and hiding inside the hollow leaf. If these insects are suspected of being in the soil before the onions are planted out, they may be effectually checked by the use of a poison bait made of bran or pollard, Paris green and molasses and water. The bran and Paris green are thoroughly mixed while dry at the rate of 50 lb. bran and 1 lb. Paris green, and stirred to a thick mash with water to which a small amount of molasses has been added. This should be scattered about on the surface of the soil a few days before the plants are set out. Applications of poison bait are best made in the late afternoon.

If the caterpillars attack the onions after they have become established, they may be collected and destroyed. They will be found during the day in the soil near the base of the plant, or, as already mentioned, they are sometimes to be found within the hollow leaf of the onion plant.

If the caterpillars were attacking onions when it was necessary to spray for thrips, the addition of Paris green or arsenate of lead to the thrips spray mixture would probably provide a remedy. Experiments might well be tried as to the effect of mixing arsenicals with the Nicotine Sulphate combination, and of their effect on the onion leaves.

ROOT MAGGOTS.

In the United States a very considerable amount of injury to the growing onions, and even to the stored product, has been experienced from time to time, as the result of the attacks of root maggots, which are the larvae of several species of flies.

These flies, of which four species are described by Dr. Chittenden, are mostly to be found in northern localities, but one at least is said to occur as far south as Cuba and Bermuda.

The seed-corn maggot (*Pegomyia fusciceps*) attacks the roots and underground portions of plants of maize, onions, leaves, cabbage, turnip, radish, peas, beets, potatoes, and many others. The imported onion maggot (*Pegomyia cepetorum*) is similar to the preceding insect; they both have a general resemblance to the ordinary house fly. The larvae attack the roots and bulbs of the onion, the injury to the latter often causing decay in the harvested bulbs.

The black onion fly (*Trioxa flexa*) differs from the preceding somewhat in appearance, principally in being darker in colour, and in the presence of three light bands extending across each wing. The larvae differ in their habit of continuing to live in the stored bulbs.

The barred-wing onion fly (*Chaetopsis aenea*) attacks living plant tissue, and is able to live and develop in decaying vegetable matter. This insect is often found attacking plants which have been injured by other pests, as for instance, following the attack of the sugar-cane beetle (*Liggyrus rugiceps*) in sugar-cane and Indian corn. It is stated that one onion grower composted 700 bushels of onions which were attacked by this pest, and as a result, his whole crop, in the next season, of 2,000 bushels was destroyed, and he was obliged to abandon onion growing for a time.

The eggs are laid just under the margins of the leaf-sheath; the larvae live and feed under the leaf sheath, where also the pupal stage is passed.

The following is copied from the paper by Dr. Chittenden, already referred to:—

REMEDIES FOR ROOT MAGGOTS.

'Owing to the difficulty of destroying root maggots and other subterranean pests and the cost of chemicals for the purpose, growers depend largely upon methods of prevention. To be thoroughly effective these methods should be employed *before the fly's eggs are laid.*

'A common method for deterring the parent flies from depositing eggs consists in placing sand soaked in kerosene—a cupful (6 fluid ounces) to a bucket of dry sand—at the base of the plants, along the rows. This mixture will also kill young maggots attempting to work through it.

'For all forms of root maggots which we are considering a carbolized form of kerosene emulsion is effective. This is prepared by adding to 1 pound of soap, boiled in 1 gallon of water, one-half gallon of crude carbolic acid, and diluting the whole with from 35 to 50 parts of water. This mixture is applied about the stalks of the plants affected. It is best to use it a day or two after the plants are up, or are transplanted, and to repeat every week or ten days until about the third week in May, in the north. Farther south these applications must be made earlier in the season.

'Mineral fertilizers are useful as deterrents, particularly when employed just before or after a shower has thoroughly wet the ground. The principal fertilizers for this purpose are kainit, nitrate of soda, and sulphate or chlorid of potash. They may be used as top dressings before planting, or if not

employed until afterwards, they should be applied as nearly as possible to the roots, the earth being turned away from the plants for this purpose. These fertilizers, also, by stimulating plant growth, facilitate recuperation from root-maggot attack.

'There is great danger in the use of other fertilizers, such as stable manure, cotton seed meal, and organic fertilizer comprising mouldy leaves, dead plant life, and even fish-scrap. In an account of this species published several years ago the writer stated that numerous instances had come to his notice, and still more noticeable instances have accumulated lately, and a long list could be furnished—where the presence of the insect could be traced to the causes above mentioned. It is advisable, therefore, to avoid the use of manure of any kind, rotted leaves, or other organic fertilizer, and, above all, to avoid further planting in fields which have been infested or contain diseased onion plants, or where cabbage, cowpeas, or any other plants have been turned under.

'As soon as seed fails to appear at the proper time or the plants show signs of wilting and maggots are found to be present, the seed may be hoed out or the injured plants pulled and destroyed, together with the younger maggots.

'Most of the methods mentioned above have been used with success against onion maggots and other root-feeding species, and are all that are required in many cases of ordinary infestation of vegetable roots.'

The cautions given in the foregoing as to the use of organic manures and green dressings apply most particularly to those districts where root maggot injury is known. In these islands there seems to be no record of such injury having been noted, and while it is advisable to keep careful watch for the first appearance of these pests, there would seem to be no need at present to change the existing practice of manuring fields in which onions are to be grown. With the first appearance, however, of root maggots, onion growers will need to observe the greatest care in respect to this point, and it may then become necessary to make certain changes in practice in order to avoid losses from root maggots' attacks.

THE CORN EAR WORM, AND THE PARIS GREEN STARCH MIXTURE.

In the *Agricultural News* for November 6 last (Vol. XIV, p. 362) an article appeared on the use of starch instead of lime for mixing with Paris green, as an insecticide, and especially for use against the attacks of the corn ear worm (*Laphygma frugiperda*) on maize.

This insect makes its first attack on the young corn plant by eating the young leaves and the developing tassel or male inflorescence in the throat or centre of the plant. An old method of checking this attack was to drop a small amount of dry mould, road dust, wood ashes or lime into the throat of the plant. Later, Paris green and lime, and corn meal and Paris green were used, and arsenate of lead has been tried.

The article referred to above gave an account of trials in St. Vincent of Paris green or arsenate of lead mixed with a cheap grade of arrowroot starch for this purpose. It was found to be efficient and economical; a very small amount sufficed, and the proportion of Paris green to starch may be made very low. The mixture may be used at the rate of 1 part of arsenate of lead to 30 of starch for young plants, while for older (half-grown) plants, Paris green may be used with starch at the rate of 1 in 100. These proportions are taken by volume and not by weight.

The amount to be used for this purpose can be regulated very nicely. Instead of dusting the mixture in the ordinary way, it is applied by means of an ordinary pen nib fixed in a holder in such a way that the same amount is applied to each plant, and that amount may be varied by adjusting the pen nib to meet the needs of the case.

This poison mixture has been found useful in controlling several other insect pests, such as the arrowroot worm, the ground nut worm, the cotton worm, and the bronze beetle.

Indian corn is now being planted, and will soon be large enough so that attacks of this pest may be expected. In St. Vincent, planters and others should be ready to meet the first of these attacks by having a supply of cheap arrowroot starch and Paris green ready for use. In other islands where arrowroot starch is not so readily obtainable, trials might be made of cheap flour, or arrowroot might be obtained from St. Vincent. The method is worthy of careful trial by everyone who grows Indian corn in the West Indies.

H.A.B.

DEGERMINATED CORN MEAL.

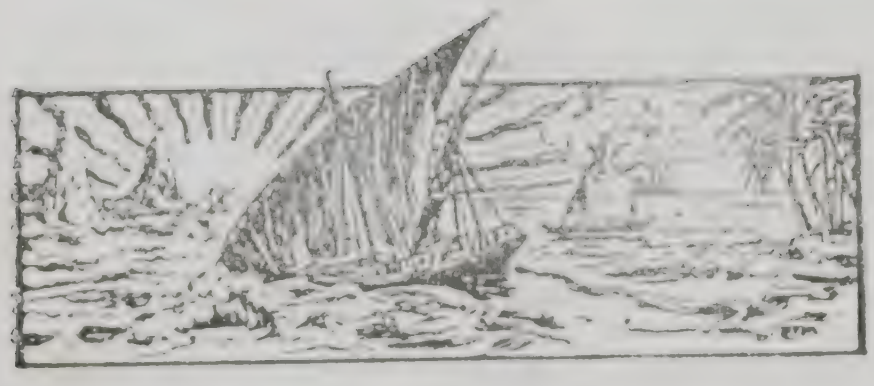
At the request of the Commissioner of Agriculture an examination of grains of locally grown maize have been made in the Government Laboratory for the Leeward Islands; the results are of interest. The maize grain is not a homogeneous mass, but is composed of six readily observable and distinctly different physical parts known popularly as (1) the tip cap, (2) the outer skin or hull, (3) the embryo or germ, (4) the horny gluten, a thin layer lying immediately beneath the hull, (5) the horny starch in which the embryo is embedded, and (6) the crown starch lying above the embryo.

According to Burtt Davy's book on maize, degermination removes the hull and embryo. It is therefore of interest to see what proportion this bears in weight to the total weight of the grain. It must be remembered that maize grains exhibit great variation in regard to their physical composition, one variety having perhaps a large embryo, while another may exhibit a high percentage of starch. Plant breeders have in fact evolved different strains having grain of a certain physical composition in order to produce grain most suitable for certain special purposes, as for instance, the production of oil.

The following two columns of figures show the physical composition per cent. of a grain grown in Antigua, and of another analyzed by Hopkins at the Illinois State Agricultural Experiment Station:—

	Antigua.	Illinois.
Horny starch and gluten	76·2	37·2
Cap and hull	10·5	7·4
Tip starch	10·2	5·9
Crown starch	2·3	11·9
Embryo or germ	0·8	11·5
Mixed waste	...	25·4
	100·0	100·0

The above figures show that there is great variation in the physical composition of maize grain, but as regards Antigua corn, and probably most corn grown in the West Indies, the preparation of degerminated meal would result in an output of some 82 per cent. of meal, if other losses, such as water, are left out of account.



GLEANINGS.

Some interesting notes on the West Indies have been running in the *United Empire*, the Royal Colonial Institute Journal. These are largely historical notes. As regards present day information, we notice that Montserrat is again referred to as the island famous for its limes, while no mention is made in the next paragraph to Dominica in this respect.

An account is given in the *Veterinary Record* of January 29, 1916, of the opening ceremony at the new Punjab Veterinary College at Lahore. In his address, the Viceroy of India referred to the fact that the new college was one of the finest veterinary establishments in the East. This is not altogether unfitting owing to the fact that the Punjab is world famous for its breeds of cattle and horses.

The *Louisiana Planter* for February 19, 1916, refers to the interesting event on the 14th of that month, when raw sugar was for the first time moved in railway cars from a Cuban factory direct to a refinery in the United States. The average load per car was 200 bags of 325 lb. each, so that the steamer which took the cargo to Key West was fully loaded. The cargo formed a solid through train to New York.

An attempt is made in *Bulletin No. 177* of the Agricultural Experiment Station, University of Illinois, to arrive at a definite conclusion as to the value of radium as a fertilizer. Upon careful analysis of the known facts, radium, notwithstanding its wonderful energy, is found to afford no foundation for reasonable expectations of increased crop yields. The conclusions previously drawn by investigators were not, it is stated, justified by the facts presented.

In *The Field* for March 25, 1916, a page is devoted to a description of cotton growing in the West Indies. The article constitutes a useful review and should be helpful in the way of bringing the subject before the public both at home and abroad. The article is well illustrated with pictures of St. Vincent and Barbados. The writer mentions the useful work done by the British Cotton Growing Association and the Imperial Department of Agriculture for the West Indies.

The question of natural *versus* synthetic indigo is dealt with in *Tropical Life* for March 1916, where it is stated that Messrs. Lewis & Peat of Mincing Lane point out in a recent report, that there has been a pressing need for natural indigo—a need which is not likely to be averted for some time to come. This firm has approached the Government with a view to getting a stipulation passed that natural indigo must be used for all blue cloth supplied to the Services

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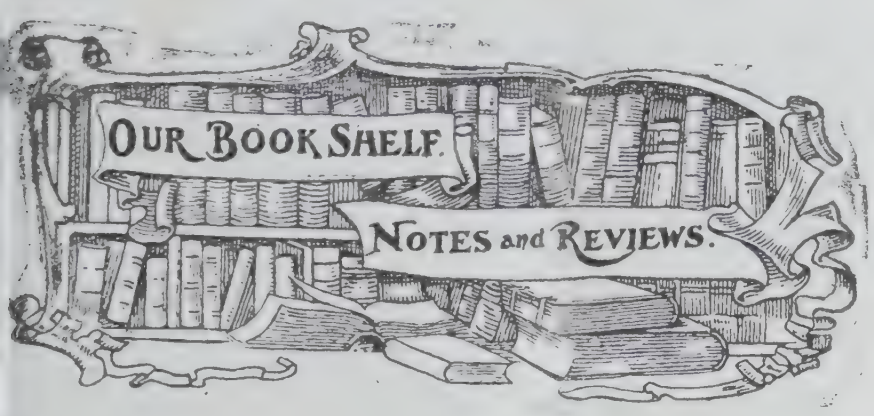
Some interesting statistics regarding the acreage under cultivation of different crops in India are given in *The Board of Trade Journal* for January 27. The estimates for 1915-16 of the area under crops are as follows: rice, 74,431,000 acres; sugar-cane, 2,508,000 acres; cotton, 16,253,000 acres; jute, 2,377,300 acres; sesamum, 3,167,000 acres; and ground nuts, 1,742,000 acres. The area under sugar-cane during the previous two years was 2,315,100 acres in 1914-15, and 2,545,500 acres in 1913-14.

The Trinidad Agricultural Credit Societies Ordinance passed on December 21, 1915, is published in full in the *Bulletin of the Department of Agriculture of Trinidad and Tobago*, Part II, Vol. XV. 1916. As well as the Ordinance itself, the various forms of agreement are also given and will prove of interest throughout the West Indies, more especially in St. Vincent and St. Lucia, where similar Ordinances have been passed.

Those interested in the milling of rice in Demerara and Trinidad will no doubt be glad to know that the United States Department of Agriculture has issued a Bulletin (No. 330) from the Bureau of Plant Industry, entitled The Milling of Rice and Its Mechanical and Chemical Effect upon the Grain. During the process of milling, the hulls, the germ, six of the bran layers and a portion of the seventh are removed. Most of the information is very technical and practical, and will no doubt be found of much use to anyone interested in the subject.

The largest irrigation scheme, by pumping, in the West Indies, is described and illustrated in the *West India Committee Circular* for April 20, 1916. This is the Vere scheme in Jamaica. The scheme entails the damming of a subterranean river, diverting the flow for about 1½ miles in the direction of the various estates, and there erecting a pumping station for raising the water about 70 feet, whence it is conducted by con- crete lined canalization, following the contour of the foot hills to the existing canals supplying the several plantations, a distance of about 6 miles. The initial programme provides for raising about 850,000 gallons per hour.

The general conclusions of the Departmental Committee appointed by the Board of Agriculture and Fisheries of England and Wales to enquire into swine fever, are that the coutinued prevalence of the disease appears to be due principally to its highly cantagious character, and the difficulty of its recognition by the pig owner in its earlier stages and its milder forms. To this must be added the difficulty of completely tracing the place of origin and a movement of pigs by which the disease has been spread. The extirpation of the disease is practicable only by such drastic measures of slaughter as involve a prohibitive outlay, and by such severe restrictions on movement as would be fatal to the industry of pig keeping. Present circumstances, therefore, do not encourage the view that the extirpation of swine fever can be speedily accomplished.



SCIENCE OF DAIRYING. By W. A. G. Penlington, M.A. *Macmillan & Co, Limited, St. Martin's Street, London, 1915.* Pp. 260 and Figs. 81. Price 2*s.* 6*d.*

The author of this book is attached to the Auchland Training College, New Zealand, where the science of dairying is an important subject of study. The book is a text-book, and is intended for use in secondary and technical schools. The treatment is therefore elementary.

The science of dairying embraces many different branches of study. There is first the chemical and bacteriological side. In regard to these the book furnishes concise information as to milk analysis and control of bacteria. Methods of cream separation are also dealt with fully, followed logically by an account of methods of butter and cheese making.

Just as in agriculture we have to study the plant as well as its products, so in dairying the cow must be studied. This resolves itself into physiology, and feeding and the study of diseases. Selection and breeding, and herd-testing are also important matters.

The book under review is, as already intimated, a school book—simple, practical, and comprehensive. Questions are given at the end of each chapter. There is a special chapter on dairy arithmetic. The illustrations throughout are excellent. Planters in the West Indies who give special attention to milk production and butter making, even though it be more in the nature of a hobby than a business, would find this book very useful and interesting.

THE SPIRIT OF THE SOIL. By G. D. Knox. With a foreword by Professor W. B. Bottomley. London. *Constable and Company, Ltd., 1915.* Pp. 242 and plates 17.

The subject of this book—the fertilizing powers of bacterized peat—has already received attention in this Journal where on page 50 of the present volume (see issue for February 12), it was pointed out that certain bacteria possess the power of liberating from peat large quantities of humates. These soluble humates are in themselves of service to plants as sources of food. They serve, moreover, as a culture medium in which nitrogen fixing bacteria—*Azotobacter chroococcum*, etc.—multiply rapidly. Hence by adding cultures of nitrogen fixers to sterilized humated peat, the amount of nitrogen in the latter is increased. The stimulating effect of bacterized peat on the plant, however, cannot, it seems, be adequately explained in terms of nitrogen supply alone, and Professor Bottomley has arrived at the interesting conclusion, that the sturdier habit of the plant is caused by a hitherto unknown class of substances which are growth stimulators. These substances he has termed auximones, while Mr Knox, the popular exponent of Professor Bottomley's work, refers to them as the spirit of the soil.

While it is indisputable that bacterized peat is capable of producing increased growth, the case for auximones is not yet conclusively proved. It is understood that further researches are being conducted independently at Rothamsted and elsewhere.

Confining ourselves to the practical side of the subject, it may be mentioned that trials both under cover, that is, in glass houses, and in the open, have recently been made with bacterized peat at Wisley, the Royal Horticultural Society's Experiment Station in Surrey. The results appear in a recent issue of the *Journal* of the Society, and indicate that under cover the peat produces remarkable results, causing great increases in branching and leaf area and flowering; but in the open, the results obtained are inconclusive.

It appears that the action of bacterized peat is intimately bound up with the question of moisture supply. An interesting fact is that a small quantity of the peat may produce as much effect as a larger quantity, but from a practical stand-point the employment of the substance in gardening is limited at present by its rather high cost.

With reference to the book itself, Mr. Knox is to be congratulated upon his treatment of the subject from a literary stand-point The book will appeal to many whom a formal text-book on such a subject might alarm. The style is vigorous and imaginative, and Professor Bottomley vouches for its accuracy. It is scarcely too much to say that the spirit of the book is no less than the spirit of the soil.

AGRICULTURAL ACTIVITIES IN THE VIRGIN ISLANDS.

A report has been forwarded to this Office by Mr. W. C. Fishlock, Curator of the Experiment Station, Tortola, recording the work done during the quarter ending March 31, 1916.

Operations at the Station were largely in the nature of harvesting work. Cotton from the cotton seed farm was picked as it ripened, the total yield from the 4·6 acres being 2,120 lb., or at the rate of 460 lb. per acre. All things considered, these returns are better than was expected, as the climatic conditions have not been favourable. Leaf-blister mite and the flower bud worm also aided in reducing the yield. The total crop of the island for the past season ha amounted to 125 bales of 200 lb. each.

At the Experiment Station during the quarter the plots of onions were reaped. The several plots, aggregating $\frac{1}{3}$-acre yielded 3,188 lb. of *dried* onions, or at the rate of 4 tons 5 cwt. per acre. The yield last year from the same plots (area given as $\frac{1}{5}$-acre) was 973 lb. of *uncured* onions, or at the rate of 2 tons 3 cwt. per acre.

The general condition of the onion industry in the Virgin Islands is stated to be good. The local markets are quite satisfactory, that is to, say, St. Thomas and St. Croix, while the same may be said of New York. Since the beginning of this year's crop, 12,500 lb. of onions have been received at the curing house. To date, 110 crates have been shipped, 60 to New York, and 50 to St. Thomas and St. Croix. Prices obtained range from $2·25 to $2·75 per crate.

The harvesting of sugar-cane varieties and the picking of limes were also effected during the period under review, while the latest planted coco-nut demonstration plot was planted up with thirteen selected varieties of sweet potatoes from the varieties under trial at the station.

The coco-nut demonstration plots, as a whole, are in good condition in spite of the dry weather. Scale insects appear to be causing some damage, but the vigour of the trees could no doubt be increased, and outgrow the insect attack, by the judicious employment of mulch.

PLANT DISEASES.

PINE-APPLE WILT.

An affection of pine-apples occurring on trial plots at Grove Botanic Station, Montserrat, has recently received attention, and is discussed below.

The plots in question were planted in July-October 1914, and the affection was first noticed about September 1915. A plot at Elberton, on heavier land, also became diseased after making good growth for about twelve months. The plants are from local stock, classed as varieties of the Ripley.

According to the account given by Mr. W. Robson, Curator, the first indication is a reddening of the foliage, which later becomes strongly marked, and the leaves wither from the tip downwards.

More than half of the $\frac{1}{4}$-acre plot is now affected, and the disease continues to spread. Its progress is not very rapid: e.g. in one bed twelve plants which were slightly affected on December 1, 1915, took until March to become seriously affected, the rest of the bed meanwhile beginning to show signs of disease.

The writer took an opportunity of inspecting the plots when passing Montserrat in March. The general appearance is that of a slowly progressive drooping and wilting of the leaves, accompanied by loss of colour, and ending in the complete drying up of the plant. Mr. Robson feels quite certain that the malady spreads to plants adjacent to those first affected, and the appearance of the beds supports this idea.

Specimens forwarded later exhibit the progression of the disease, and show quite clearly that it is a question of root decay. The worst affected plant had hardly any functioning roots, the least affected was fairly well provided, and the others were intermediate. In all the specimens the actual tissues of the stems, apart from the root traces, which were discoloured, were quite sound, thus differentiating this disease from the one seen at La Guérite, St. Kitts, in 1914, described in the *Agricultural News*, Vol. XIII, p. 190. Many of the more recently developed roots were twisted around the stem.

The affection conforms to the condition known as pine-apple wilt or blight, which seems to be well known in all the principal countries in which the crop is grown. An adequate description of it, referring to specimens received at this Office from an un-named source, was given as early as 1902 in the *Agricultural News*, Vol. I, p. 191. It was described by Stockdale, under the names of tangle-root and blight, in the *West Indian Bulletin*, Vol. VIII pp. 158-61, and has attracted considerable attention in Jamaica. Specimens similarly affected were forwarded by Mr. Robson from Grove in 1907, and from Trants in 1913.

In the specimens under consideration there are present in the roots from an early stage of their failure, fungus hyphae occupying the vessels, and the presence of hyphae is referred to by most writers on the subject. Most commonly the fungus is referred to as a *Fusarium*. L. D. Larsen (10) obtained *Thielaviopsis paradoxa*, *Trichoderma lignorum*, and a *Fusarium* from diseased roots, but was unable to reproduce the disease by inoculation. The presence of such fungi on the roots is not of much value as evidence of their pathogenic nature unless a particular fungus is well-marked and constant, and these conditions are not satisfied in this case. The evidence which is most suggestive of a parasitic origin for the disease, is that with regard to its communication from one plant to another, but in this respect the evidence from different countries is conflicting. Smith (9) says: 'In practice we have reason to believe that a diseased stock will prove a centre of infection for surrounding plants.' Lucas (8) says: 'In a field of Ripley pine-apple plants after the wilt makes a start, no matter how small the affected area might be, it will in an incredibly short space of time spread over acres and in a few months will completely kill every plant, no matter whether the plants be old or young, but this disease seldom allows the plant to become of any age before it completes its work of ruin.' Henricksen and Iorns (9) and Wester (11) adopt the view that the disease is infectious and trnsmissible to suckers, but do not say that this is based on actual observation. On the other hand, Tryon (5) states definitely that affected suckers planted under good conditions, will produce healthy plants, and further that the disease is only exceptionally communicated from plant to plant. Larsen (10) also says. 'The malady as occurring in Hawaii does not seem to spread from one plant to its neighbour, but appears in a sporadic manner, affecting one plant here and another there. Thus far it has been of most general occurrence in the wetter districts and in fields of young and healthy plants.'

Accordingly there are two sets of ideas more or less opposed with regard to the nature of this disease:

(a) That it is due to infection with a fungus capable of definite parasitism, causing a disease resembling in its nature those produced by the parasitic soil Fusaria. This would involve the very early eradication of affected plants and their immediate neighbours, some attempt at sterilization of the surrounding soil (say with quicklime), the avoidance for a long time (at least a year and very possibly several years) of infected land for replanting, and very careful precautions against infecting new land with any sort of material from the old. The most hopeful measure in such a case is the search for, and adoption of suitable resistant varieties. In forwarding specimens in 1907, Mr. Robson stated that the Red Spanish variety was quite immune. In the present case, in a plot of Red Spanish situated between two very badly diseased plots of the local (Ripley) type, nine out of fifty-seven plants show some indication of the same disease. Lucas (8) says: 'all varieties of the Queen family (which includes the Ripley) are of delicate constitution, subject to Black Heart and Wilt. . . . . The Red Spanish is vigorous, free from disease and easy to grow.'

(b) That the disease is primarily due to some unfavourable condition or conditions of growth, including physically unsuitable, poorly prepared, insufficiently drained and cultivated soil (all leading to a restriction of aeration): poverty of soil, lack of water, and poorly prepared planting material, these conditions being either sufficient of themselves to bring about the failure of the plant, or rendering it liable to attacks of one or more weakly parasitic fungi, thus producing a disease similar in nature to the root disease of sugar-cane associated with *Marasmius*.

Taking these conditions for discussion in the order named: (1) *Aeration.* It is universally admitted that this plant is intolerant of any restriction of the air supply to its roots. (2) *Nutrition.* Given good aeration the consistency of the soil is of minor importance: it appears that the plant will grow well in any soil rich in humus, but especially in light soil it is necessary that the supply of food be kept up. The plant will grow well in leaf mould until the food is exhausted, and is grown in Florida in sand with the addition of chemical manures. It would seem that some difficulties have arisen through the supposed ability of the plant to thrive in any light soil having resulted in the choice of land in a dried out or exhausted condition. It is important to note in this connexion that the plant has a very

nited root range. (3) *Lack of Water*. The plant is well protect- against drought, but cannot be expected to do more than rvive in periods when the comparatively shallow layer enetrated by its roots is dry. This points to the need in ry districts of close planting to shade the ground, mulching f the surface with leaves, or the maintenance of an effic- nt dust mulch. (4) *Poorly Prepared Planting Material*. he existence of the condition known as tangle-root, though s occurrence does not necessarily mean that the plant will be unhealthy, certainly impairs its powers of resistance o root disease, reducing the effective root system and hinder- ng the development of new roots to replace the old. It is aused by the persistence, in a leathery condition, of old leaf- ases at the time when the new roots are growing out behind hem, so that these are led to grow around the stem. It may e avoided in young plants by stripping or trimming the ower leaf-bases before the plants are put in. Decay of the ase of the stem, by forcing root development higher up, ometimes induces this condition. Under relatively dry soil conditions stripping is probably always necessary; in wet situations natural decay of the leaves is more rapid, and the operation may be dispensed with. In this connexion Sharp (3) a Jamaica grower states: 'We also carefully remove before- hand the leaf sheaths from the base of the sucker so as to allow the roots to grow out at right-angles. If this is not attended to and the plant is unable to throw off the sheath, the roots early tend to become tangled and often twist around the plant, which although apparently healthy for some time, will sicken and die when the time for reproduction arrives.'

In the case of the beds at Grove Station there is no unfavourable factor apparent The soil is a deep black mould, inclined to be sandy, and has been manured and cultivated to what would seem to be a quite adequate extent.

On the other hand, none of the specimens examined, from 1907 to the present time, has revealed the presence of any parasitic organism adequate or constant enough to account for the affection. It is intended to follow up the matter in a series of further experiments.

W.N.

1 1895 Webber, J. H. : Year-book United States Department of Agriculture, 1895, 281.

2 1901 Webber, J. H. : *Bulletin of the Botanical Department, Jamaica.* VIII, 83.

3 1901 Sharp : *West Indian Bulletin* II, 119.

4 1902 Smith, C. E. : *Bulletin Botanical Department, Jamaica*, IX, 161 (*West Indian Bulletin*, IV, 110).

5 1904 Tryon, H. : *Queensland Agricultural Journal*, XV, 477.

6 1907 Lucas, G. L. : *Bulletin Department of Agriculture, Jamaica*, V, 41.

7 1907 Lucas, G. L. : *West Indian Bulletin*, VIII, 151.

8 1907 Stockdale, F. A. : *West Indian Bulletin*, VIII, 158.

9 1909 Henricksen & Iorns : *Porto Rico Agricultural Experiment Station Bulletin*, 8.

10 1910 Larsen, L. D.: Hawaiian Sugar Planters' Association *Pathological Bulletin*, 10.

11 1912 Wester, P. J. : *Philippine Agricultural Review*, V, 530.

In a letter received recently from Montserrat, Mr. W. Robson the Curator states that experiments have indicated that local varieties of Lima bean are not very successful there when grown on a field scale. He considers that it will be necessary first of all to secure the right type. He suggests concerted action by the different local departments whereby seed of satisfactory types could be distributed amongst the departments. The opinions of local officers would also be welcome in regard to the time of year their particular types should be planted.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of March:—

In reviewing the Produce Markets for the month of March, it is necessary to say that on this occasion they cover a period of five weeks the first auction having been held on the 2nd of the month and the last on the 30th. Throughout the whole of this period there has been a steady and uniform amount of business in drugs; chemicals and produce generally, both in quantities and prices. The following are some of the details relating to West Indian products:—

GINGER.

Throughout the month ginger has held a firm position. At auction on the 15th, good washed Cochin fetched from 46*s.* to 47*s.* per cwt., and Sierra Leone 39*s.* to 40*s.* On the 22nd common Cochin was quoted at 42*s.* 6*d.*, fair at 45*s.*, and good washed at 47*s.* 6*d.* There were no quotations for Jamaica.

SARSAPARILLA.

At auction on the 9th, sarsaparilla was in good supply and fair demand, as follows: Grey Jamaica, 47 bales were offered and 38 sold at from 1*s.* 6*d.* to 1*s.* 7*d* per ℔. for part coarse and mouldy, to 1*s.* 8*d.* for fair grey fibrous. Of Lima-Jamaica 17 bales were brought forward, but none sold. Of native Jamaica 34 bales were also offered, but found no buyers, while for Honduras, 15 bales were sold out of 16 offered, fetching 1*s.* 8*d.* to 1*s.* 9*d.*

CITRIC ACID, KOLA, ANNATTO, CASHEW NUTS, CASSIA FISTULA, LIME OIL, LIME JUICE, AND PIMENTO.

Citric acid has been advancing steadily throughout the month. At the beginning it was obtainable at from 3*s.* 2*d* to 3*s.* 2½*d.* per ℔. A week later it was reported scarce at 3*s.* 3*d.*, and at the close of another week it was almost unobtainable at 3*s.* 5*d.* increasing in the closing week to 3*s.* 9*d.* Kola was fully represented at auction on the 9th, by 241 packages but none were sold: 6*d.* to 6½*d.* per ℔. was asked for good dried Ceylon halves, and 5*d.* to 6*d.* for Java; 26 packages of annatto seed were also offered at the sale on the 9th; and 10 were sold, ordinary Ceylon fetching 6*d.* per ℔. and sea-damaged Madras 4¾*d.* to 5¼*d.* Three packages of cashew nuts were offered at the sale on the 9th but none were sold. At the same auction 6 baskets of East Indian Cassia Fistula were brought forward but found no buyers. The quotation for West Indian distilled oil of lime has been 9*s.*, and for hand pressed 8*s.* 6*d.* At the end of the month, however, these prices had advanced, 10*s.* to 10*s.* 6*d.* being asked for distilled. Lime juice has been in good supply throughout the month at from 3*s.* to 3*s.* 3*d.* per gallon. Pimento towards the end of the month had slightly advanced on previous rates.

MARKET REPORTS.

London.—The West India Committee Circular, April 20, 1916.

Arrowroot—2½*d.* to 4½*d.*
Balata—Sheet, 3*s.* 4*d.*, block 2*s.* 2½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 80*s.* to 81*s.* 6*d.*; Grenada, 78*s.* to 85*s.* 6*d.*; Jamaica, 76*s.* 6*d.*
Coffee—Jamaica, no quotations.
Copra—£36 10*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 7*d.* to 23*d.*
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—39*s.* to 42*s.* 6*d.*
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £8 10*s.*
Mace—11*d.* to 2*s.* 6*d.*
Nutmegs—8½*d.* to 1*s.*
Pimento—No quotations.
Rubber—Para, fine hard, 3/; fine soft, 2/10; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per ℔.
Ginger—15c. to 18c. per ℔.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per ℔.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per ℔.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per ℔.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 5, 1916.

Cacao—Venezuelan, $16·00 to $16·50; Trinidad, $15·00 to $16·00.
Coco-nut Oil—$1·15 per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c.
Copra—$6·50 per 100 ℔.
Dhal—$6·75 to $7·00.
Onions—$5·00 to $5·50 per 100 ℔.
Peas, Split—$9·00 to $9·20 per bag.
Potatoes—English $2·75 to $3·00 per 100 ℔.
Rice—Yellow, $7·00 to $7·50; White, $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations

Barbados—Messrs. James A. Lynch & Co., [illegible] May 3, 1916; T. S. Garraway & Co., May 3, 1916.

Arrowroot—$5·00 per 100 ℔.
Cacao—$16·00 to $17·00 per 100 ℔.
Coco-nuts—$18·00 husked nuts.
Hay—$1·90 per 100 ℔.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $100·00 to $105 per ton.
Molasses—No quotations.
Onions—$6·00 to $7·50.
Peas, Split—$9·50 to $10·00 per 210 ℔., Canada, $6·00 per 120 ℔.
Potatoes—Nova Scotia, $3·50 per 160 ℔.
Rice—Ballam, $7·30 to 7·60 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·25.

British Guiana.—Messrs. Wieting & Richter, March 31, 1916; Messrs. Sandbach, Parker & Co. Jannary 7, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	18c. per ℔.	20c. per ℔.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	8c. to 8½c.	9c. per ℔.
Dhal—	$6·75 to $7·00	$7·25
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 14c.	12c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·50 to $5·00	$3·25 to $3·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$3·75 to $4·15	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

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Modern Views Regarding Plant Disease Legislation.

THE question of legislating for the control of plant diseases presents many and great difficulties, some of which, at least, are not appreciated by the lay mind. A paper on the subject appears in the recent issue of the *West Indian Bulletin* (Vol. XV, No. 3), by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, which should prove helpful to all concerned with this important subject. In this it is pointed out first, that the demand for legislation generally arises from the occurrence of some destructive outbreak, which is sufficiently alarming to give rise to the feeling that the Government should promptly intervene with a view to eradication. Generally the object in view is to prevent the spread of the trouble from the lands of those who may be negligent to the lands of those who are endeavouring to control the trouble. It is nearly always a simple matter to cope with a situation of this kind, but when other pests and diseases which are of such a nature as to give less cause for alarm appear, the question of Government intervention is not so simple. There are many difficulties in connexion with legislating against these less alarming troubles. In the first place it may be difficult exactly to define the nature of the particular pest or disease to be able to state what are the exact causes, and for scientific advisers to be able to suggest definite remedies or methods of prevention. Moreover, when a disease assumes only a minor degree of importance, there are local wranglings and doubts as to the real necessity for rigorous action, and this leads to administrative troubles. It is nevertheless clear that the State ought to concern itself in an intelligent and enlightened manner with the general control of plant pests and diseases, and Dr. Watts in his paper referred to above, suggests that this might be done as follows. All pests and diseases of plants should, it is considered, be regarded as falling into two categories: namely, those that are of considerable gravity, and those, which while troublesome, are of a lesser degree of seriousness. In regard to diseases of the first class, legislation should provide for the definition and description, and should make provision for detection, notification and ultimate control for the use of the proper authority. Pests and diseases of this class might be known as

Notifiable Pests and Diseases. It would appear desirable that the main body of any Ordinance should not be encumbered with lengthy details. These could be better dealt with in schedules and regulations made under the Ordinance. A matter of importance in connexion with the operation of such legislation is the fact that the serious nature of the trouble may entail grave consequences, as for example, it may be necessary in the last resort for the Government to take over the infected land so as to afford adequate protection. It would be important that regulations should have ample consideration before being brought into effect, and in view of this, additions to the list of Notifiable Pests and Diseases and the regulations relating to them should be made by the Governor, with the approval of the Legislative Council.

Examples of such diseases as should be made notifiable are the Panama disease of bananas, and bud rot of coco-nut palms. At the end of the paper under review two draft orders are given containing provisions, according to the above ideas, for the control of these diseases.

Turning now to the second class of pests and diseases, which are those infectious and liable to do harm, but not of such danger as to render it necessary to make them notifiable, it is easily seen that the operation of the law is less easy owing to the less definite and circumscribed nature of the troubles to be dealt with. As regards means of ascertaining the occurrence of such diseases, examples of which are love vine, bleeding stem disease of coco-nuts, locusts, parasol ants, etc., it is stated in the paper that regular Inspectors having adequate authority must be appointed, and these Inspectors would, in the course of their duties, obtain information as to the occurrence of these plant maladies. As soon as the existence of an infectious, but non-notifiable disease is known, the Inspector should inform the owner of the crop what measures should be taken. Generally this will suffice, and the owner will follow the advice. If there is neglect, however, there are two lines of action open to the Government, each depending upon the circumstances of the case. If there appears to be no likelihood that the disease can spread from the infected area, the owner may be left to his own devices. Where, however, the neglect is likely to lead to injury resulting to other people, the Inspector, or other authority, should have power to apply to a magistrate for an order directing the person to take steps to remedy the matter. Before granting the order the magistrate would have the opportunity of learning from evidence whether the undertaking of remedial or preventive measures is practicable, and he would also avail himself of the advice of scientific officers of the Agricultural Department, which is an integral part of all governmental machinery in well regulated communities, and especially so in the tropics. Penalties should attach to any neglect to comply with the magisterial order. It is thought, however, that an extreme course of action like that just described would generally be found unnecessary, for cultivators in most cases would be ready to take steps. Power to enforce action must nevertheless be provided for. The above method has special advantages: it allows of each case being dealt with on its merits, and permits the application of the best knowledge existing up to time of enquiry. In view of the change in ideas resulting from research, any hard and fast plant disease legislation can never be efficient in practical operation. There must always be provision for dealing with cases according to the knowledge of the times; in other words, plant legislation must to a certain extent be elastic.

In accordance with this idea, the list of infectious but not notifiable diseases will from time to time be modified, depending on the degree of prevalence and virulence of such diseases, and, owing to the lesser gravity of the matter, these alterations may conveniently be made by the Governor-in-Executive Council without reference to the general legislative body. It is obviously important that cultivators should be informed by the Agricultural Department as to the appearance and nature of all pests and diseases, in order that they themselves may assist the Government in giving effect to legislation for the general good.

Dr. Watts's paper concludes with a consideration of another aspect of the control and spread of plant diseases, namely, Quarantine. All plants imported should be subject to inspection by officers appointed for the purpose. It often happens, however, that the presence of diseases in imported material cannot possibly be detected by ordinary inspection. Power should, therefore, be given to enable the authorities to place the plant suspected for a specified time in a Government Quarantine Station, or the importer might be permitted, perhaps, to put the plant in some approved place in which it would be subject to inspection by a properly qualified officer of the Government. A further aspect of the same

question is the desirability to make provision for prohibiting the importation of any kind of plant, including seed from countries where any dangerous pest or disease of that, or an allied plant, is known to exist: at the same time it would be well to have the means of prohibiting the importation of any plants whatsoever in certain circumstances from any particular country where some particular virulent trouble may be known to exist.

One thing in regard to plant legislation and its execution is, that it must be conducted in a rational manner, and in the light of the latest scientific knowlege. Many laws are in operation which in their effects are practically useless, owing to inadequate consideration having been given to the scientific side, or perhaps through scientific knowledge having been inadequate at the time the enactment was made. Plant disease legislation may be expected to require amendment from time to time as our knowledge progresses.

BOTANICAL IDENTITY OF WEST INDIAN SOUR GRASSES.

It having occurred to the Commissioner of Agriculture that there were differences between the forms of so-called 'sour grass' observed at Antigua and Montserrat and those occurring in Barbados, the matter was referred to Kew, and, as the outcome, the whole question has been carefully investigated by Dr. O. Stapf, who has examined the material available at Kew. He has, in consequence, prepared a preliminary paper discussing the relationship of the allied grasses occurring all over the world.

Pending the completion of the investigations, Sir D. Prain, Director of the Royal Botanic Gardens, Kew, has kindly forwarded to this Office the paper embodying the conclusions reached up to the present, which in its completed form will ultimately be published in the *Kew Bulletin*. A summary of the present conclusions is now given for the information of readers of the *Agricultural News*.

The name *Andropogon pertusus* has of late been applied to the 'sour grass' of Barbados, which is assumed to have been introduced into the West Indies at some time unknown, and the extension of the name to the sour grasses of the Antilles generally has been due to the notion that they were all of one species; such apparently slight modifications as were observed being considered as coming within the range of ordinary fluctuation. The consideration that the forties of the last century, at which time specimens were collected in Antigua, seemed a very early date for the introduction into the West Indies of a fodder plant whose economic value was apparently not appreciated until many years afterwards, has led to an investigation of the West Indian sour grasses so far as was possible with the use of the specimens to hand.

The first references to *Andropogon pertusus* as a fodder plant are Australian in origin, and date back to the middle seventies. Australian writers do not suggest that the grass is an introduced species into that country. In a book published in 1888, it is stated that a grass known by this name is universally esteemed as a good fodder grass all over the plains of Northern India.

Mention of the economic importance of the West Indian sour grasses was made by Mr. C. A. Barber in 1894, and Mr. J. R. Bovell in 1895, writing from Antigua and Barbados respectively. The former used the name *A. saccharoides* and the latter *A. pertusus*. There is a Barbados specimen at Kew dated 1869, and as early as 1830 Maycock's *Flora Barbadensis* mentions a 'narrow-leaved' sour grass in that island. The adjective was used to distinguish it from other grasses earlier known by that name, and his description shows that he meant a grass coming within the present use of the term.

There appear to be three grasses known as *Andropogon pertusus* and valued for fodder, i e., Barbados sour grass, the 'pitted blue grass' of Australia, and the Indian grass already referred to.

Andropogon pertusus was described by Linnaeus from Indian specimens. It is a characteristic plant of old pasture ground in the Gangetic plain and the Punjab, and occurs further south as far as Ceylon. It has also been collected in various Asiatic and African localities.

The Australian plant appears to be a form of *Andropogon intermedius*, R. Br. The West Indian material at Kew falls into three groups; of these Set (1) has the nodes *bearded* and the sessile spikelets *not pitted*. It has been collected in Dominica, Antigua, and Montserrat. Set (2) has the nodes *glabrous* and the sessile spikelets *pitted*. The specimens are from Barbados, Nevis, and Guiana, the last named from cultivated material originally received from Barbados. Set (3) is intermediate between (1) and (2), the nodes being glabrous or more or less pubescent, the sessile spikelets either pitted or not pitted in the same inflorescence, but prevalently not pitted. The specimens come from Barbados, Tobago, and St. Vincent.

Dr. Stapf reaches the conclusion that Set (1) is identical with Hackels' var *americanus* of *A. Ischaemum*, and proposes to raise it to specific rank under the name *A. feracidulus*. This he considers as quite distinct from the remainder, and truly indigenous.

Sets (2) and (3) are very closely allied to *A. intermedius* but more information is required before coming to a definite decision as to their origin. Dr. Stapf puts forward the hypothesis that they may have originated by crossing between *A. feracidulus* and an introduced form of the Old World *A. intermedius*, and proposes the name *A. intermedius*, var. *acidulus*.

For the sake of clearness, the generic name Andropogon has been retained in this summary, but it must be indicated here that Dr. Stapf agrees with the elevation of the sub-genus Amphilophis to generic rank, so that the species above referred to will become *Amphilophis intermedia*, Stapf, *Amp. feracidula*, Stapf, and *Amp. pertusa*, Nash.

Further information bearing on the points not yet cleared up is being sought both in Australia and the West Indies.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. Brooks's notes for April state that in the Experiment Station, work included the reaping of cane, the sowing of a second consignment of *Coffea robusta*, the transplanting of limes, the planting of plots of camphor and bay trees, and the budding of limes on sour orange and citron stocks. In the Botanic Gardens, at Castries, the centre middle drive, with three driving entrances, was completed during the month. A water-basin 20 feet in diameter was formed between the two entrances at the eastern boundary ,and fitted with a revolving fountain throwing four sprays of water. The basin is edged with large lumps of coral. The adjacent bank has been planted with a row of Travellers' palms along the iron fencing, to close the view of the public roads, and the slopes have been planted with various palms, ferns, begonias, caladiums, iris, ginger lilies, eucharis lilies, tuberoses, alocasias, and other plants. The orchid collection has been removed from the nurseries and the plants are now suspended in baskets on wires from the branches of two mature specimens of *Ficus benjamini*, overhanging the water. The adjoining rockery is made of coral and is being extended and planted with ferns, selaginellas, and begonias. A considerable amount of work was performed in preparing the gardens for the fête in aid of the French Red Cross, which was held on Easter Monday.

Mr. Brooks's observations relating to staple crops furnish the information that the reaping of cacao continues. The promise of heavy crops of limes in June and July is indicated, and there is a continued steady extension of the area under this crop. A good crop of sugar is being harvested and an extension of the area under this crop also is taking place. Work has been begun in connexion with enlarging the lime juice buildings. The advisory committee of the factory held a meeting during the month, and Mr. Auguste, late pupil of the Agricultural School, was, on the advice of the committee, appointed by His Honour the Administrator, Manager of the Factory. During the month also, there was a meeting held in the Micoud district in connexion with the formation of agricultural banks. This meeting was conducted by the Inspector of Agricultural Banks. Arrangements are being made between Mr. Brooks and the Head Master of St. Mary's College to utilize the Botanic Gardens for the study of Botany. The lime juice factory was to open on May 27. The rainfall during the month at the Botanic Gardens was 3·50 inches, while at the Experiment Station at Choisuel, 2·01 inches fell.

MONTSERRAT. Mr. W. Robson says that operations in the Stations have been practically at a standstill on account of the drought, and crops will therefore be later than usual. The nursery shelter for raising bay seedlings is completed. A plot of yellow plantain was planted at Harris station to provide slips for distribution. Plantain is becoming scarce. In regard to the staple crops, a portion of the cotton crop was put in late in March and early in April, but the bulk of it, particularly on the leeward side, remains to be planted. The young fields are looking fairly well, some rains having fallen in the Windward district. Rain is much needed to develop the lime crop. It is stated that a weekly collection of Exophthalmus weevils on the lime experiment plot was commenced. As regards the Onion Growers' Association, it is stated that this has finished operations; the number of crates shipped was 662 together with 63 barrels, and financially the venture promises to be successful. The result of the shipment of 198 crates to Canada is awaited with interest. Mr. Robson says that a good deal more could be done with papaws at the present time, particularly on the part of the peasants. The proposed experiments at both Harris and Grove stations are, therefore, opportune. The rainfall at Grove Station was only 0·74 inches during April, and this was distributed over eleven days.

ANTIGUA. According to Mr. T. Jackson, the young cane crop is rapidly improving, and the area under cultivation has increased. This applies especially to the peasant crop. As regards this year's crop, it is stated that in most cases the yields obtained have exceeded estimates.

As regards work in the experiment stations, this has principally concerned the reaping of the sugar-cane experiment plots. It is said that large orders have been received for forest trees. During the month the following plants were distributed: 188 Eucalyptus, 20 coco-nuts, 22 decorative plants, and 30,000 sweet potato cuttings. Early in the month of May, the Antigua Cotton Growers' Association was formed, which should help to give greater stability to this industry in Antigua. The rainfall for the month was 4·93 inches.

NEVIS. Mr. W. Howell writes to the effect that the reaping of the cane crop is still in progress and prices are still fairly good. As regards cotton, a fair acreage of land is already prepared, but, on account of the dry weather, no planting has been done. Mr. Howell states that much more land will be put under cotton this year than last year, but the acreage will not be what it usually is. Provision crops suffered very much during the past six or eight weeks on account of the dry weather. It is thought there may be a shortage in about August. Mr Howell paid a visit to Antigua and Montserrat in connexion with the onion industry. As reported in the last issue of the *Agricultural News*, the Administrator presided at a cotton meeting held in the island during the month. The rainfall for the month was ·75 inches.

VIRGIN ISLANDS. Writing from Tortola, Mr. W. C. Fishlock complains of very dry weather. Owing to the drought, it was possible to do but little work connected with planting in the Experiment Station. In regard to staple crops, the sugar and lime crops will show an increased production. Cotton will probably be below the average. As regards the coming cotton crop, a good deal of interest appears to be shown at Jost-van-Dyke and Virgin Gorda especially.

Peasant Agriculture in Grenada.—The Government of Grenada has furnished this Office with a report of the Agricultural Instructor for April last. In this it is stated that attention was given in connexion with the Prize Holdings Competition, and that up to April 30 more than 300 entries had been obtained. In connexion with land settlements, it is noted that the construction of roads at St. Cyr Mountain has been completed, and that allottees are settling their instalments and interest in advance. As regards crops, cacao continues to be satisfactory, having maintained its increase over the previous crop up to May 6, and having up to April 30 passed the total of last year up to September 30. The report says that the lime crop is about 50 per cent. better to date than last year. In the experiment plots, satisfactory crops of eddoes have been reaped at Morne Rouge and Westerhall; while the sugar-cane planted in November at the Morne Rouge plot, on ridged and furrowed land, has stood the season better than any other sugar-cane in the district, which is all planted in square holes. The horse beans sown on the ridges between the sugar-cane in December are coming through the season green and healthy.

COVER CROPS USED IN PORTO RICO.

A valuable account of cover crops for Porto Rico is contained in Bulletin No. 19, issued by the Porto Rico Agricultural Experiment Station. It contains a useful description of the Stizolobiums, and of plants belonging to several other genera. The sword bean (*Canavalia gladiator*) is referred to as a valuable cover crop for affording wind protection in citrus orchards, as its high growth prevents the wind from sweeping below the tree branches, and maintains the quiet atmosphere in which the scale-destroying fungi thrive. The Stizolobiums are referred to as a group sensitive to drought, and as a species preferring a sandy loam soil. The pigeon pea (*Cajanus indicus*) has proved a very satisfactory wind-break in Porto Rico until citrus trees are three or more years old. This is well illustrated in Plate 2 in the publication.

The Bulletin ends with the following summary:—

Lands devoted to horticultural crops in Porto Rico are very deficient in humus and vegetable matter, and are greatly damaged by surface washing.

Cover crops were first cultivated in Porto Rico by planters who became interested in citrus growing after the American occupation of the island.

There is a great difference in soil types and in local weather conditions, making the selection of a cover crop which will give most satisfactory results, of great importance.

The cowpea is grown in all parts of the island. It has the shortest growing season of any of the legumes described in this bulletin. It is valuable as a cover crop and as a food.

The jack bean, although lately introduced is in more general use than any other cover crop. It thrives on all except very light land, and, on account of its habit of growth, is very desirable in citrus orchards.

The Lyon bean, the Mauritius bean, and a number of other lately introduced velvet beans succeed well on all types of Porto Rico soils where horticultural crops are grown. They are recommended for growing in open fields or for general use, where care is taken to prevent injuries by the rank-growing vines.

The pigeon pea succeeds well in all parts of the island. It is cultivated for its edible seed, and as a cover crop and wind-break. Under favourable conditions the plants continue their growth for a few years.

The thrifty annual legumes which are growing wild are valuable, and should be protected and encouraged. They reseed themselves and are very resistant to drought and heavy rainfall.

The vegetable matter in Porto Rico lands devoted to citrus culture soon disappears when clean cultivation is practised. The soil and climatic conditions favour the employment of cover crops throughout the sections where citrus fruits are grown.

In old coco-nut groves, where there is a good stand of trees, the dense shade prevents a thrifty growth of cover crops. In young groves, or where the stand of trees is poor, velvet beans, jack beans, and cowpeas are satisfactory cover crops. Cowpeas and pigeon peas are used both as cover and catch crops in coco-nut groves.

Pigeon peas and jack beans hinder the growth and production of Cabezona and Red Spanish varieties of pine-apples when planted in the bed with them. The pigeon pea was more harmful than the jack bean, and the development of the Cabezona variety was retarded more than the Red Spanish.

Cover crops make their heaviest growth and serve their purpose best when planted in spring or early summer.

Nodule-forming bacteria are present in most Porto Rican soils. Where the bacteria are wanting, inoculated soil should be scattered over the field at the time of seeding the cover crop.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 1, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 150 bales of West Indian Sea Island cotton have been sold, chiefly Montserrat 18*d.* to 18½*d.*, and Antigua at 17*d.*, with a few stains at 10½*d.* Prices are steady, but spinners are selecting their lots very carefully.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 6, 1916, is as follows:—

ISLANDS. This crop has been entirely disposed of, leaving no stock here or on plantation; consequently the market is closed until the new crop is marketed.

The following quotations are only nominal, but represent the closing prices paid, viz.,

Extra Fine 31c. to 32 = 20½*d.* to 21*d.*	c.i.f. & 5 per cent.
Fully Fine 30c. = 20*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. Since our last circular report of April 15, there has been little change, the market remaining firm with sufficent demand to take the limited offerings at quotations, and exporters have been able to dispose of their holdings to advantage. The buying has been on account of the Northern Mills.

The supply unsold has been very much reduced, and is firmly held.

In a limited way can buy at quotations, viz:

Fancy	31c. = 32¼c.,	landed.
Extra Choice	30c. = 31¼c.,	,,
Choice	29c. = 30¼c.,	,,

The exports from Savannah since April 15 were, to Northern Mills 1,052 bales, Southern Mills 470 bales, and from Jacksonville to Northern Mills 50 bales.

CROP ADVICES. In Carolina there has been little if any increase in the acreage on the Islands. A larger proportion of crop than usual has been planted in prolific seed, classing Fine to Fully Fine, which is more remunerative to planters at the prices now ruling; consequently the supply of Extra Fine will be more limited. This applies partly to the crop lots of Extra Fine and above, as the small premium paid for the selected grades of Extra Extra has induced some of the planters to return to a more prolific seed.

In Florida and Georgia there is reported an increase in acreage of 10 to 15 per cent., and some more attention has been given to selection of seed.

The crops in all three States are suffering from continued spell of dry weather. The stands obtained are irregular and broken, and some replanting has been necessary. With cool nights the plants have made slow progress, and are backward. In all sections there is urgent need of good rains, which would much improve the outlook.

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester up to May 6, 1916, were 754 and 443 bales, respectively.

COTTON CONFERENCE.

THIRD DAY'S PROCEEDINGS.

(Concluded.)

PESTS AND DISEASES OF COTTON, AND THEIR CONTROL.

In opening the discussion on this subject, the President said he thought that previous discussion had shown that cotton is not threatened with any general epidemic which is likely to be disastrous to the cotton industry as a whole. There were, however, diseases which required careful consideration. Before proceeding to consider West Indian pests and diseases, the President thought it would be stimulating if Mr. Ballou, the Entomologist to the Department, gave a brief account of the Mexican boll weevil and its spread in the United States. This pest was a menace to the American Sea Island cotton industry, and its steady, spread and the campaign against its spread presented features of great interest.

Mr. Ballou then gave first, a short historial account of the spread of the boll weevil from Southern Texas northwards. It was discovered in Southern Texas in 1892. The Government failed to declare a quarantine line, and since 1892 the pest has spread year by year through the cotton-growing areas of the Southern States, doing enormous damage. Every time the pest has struck a new area it has reduced the output of cotton in that area about 50 per cent. A remarkable feature is that, of recent years, the yield of cotton per acre in the infested areas has gone up, due to the introduction of better systems of cultivation—changes necessitated by the pest with a view to its control. Mr. Ballou then indicated on the map the progress of the spread of the boll weevil from Texas to Oklahoma and Arkansas, Louisiana, Mississippi, Alabama, Western Florida and Georgia, with the certain prospect of its proceeding on to South Carolina. Mr. Ballou estimated that it would not be later than 1922 before the American Sea Islands which are just off the coast of South Carolina would be infested by the boll weevil, resulting in the disappearance of the American Sea Island cotton industry. In conclusion, Mr. Ballou pointed out the grave responsibility which would rest upon anyone importing material from America likely to carry the pest, though as a matter of fact, there was some reason to believe that in these islands the boll weevil might not assume such serious proportions as it did in the Southern States.

The President in remarking on Mr. Ballou's observations, said that the control of the boll weevil by changes in methods of cultivation was on a smaller scale paralleled by the planting of cotton in Antigua at a certain period to avoid the flower-bud maggot. The President then asked Mr. Nowell, the Mycologist of the Department, to make a statement concerning the internal boll disease of cotton—a serious affection which is very widely spread throughout the West Indies, the importance of which has only recently been realized.

Mr. Nowell said that this boll disease had been recognized in Montserrat for many years, but its exact cause had not been definitely cleared up. The unique feature about the internal boll disease was that the bolls appear on the outside perfectly healthy, even up to the stage when they ought to be opening and showing their ripe cotton; but within, in the later stages, one or more locks of the boll contain only rotting material. Such a condition was difficult to account for, as boll diseases generally start from the outside and spread from the wall of the boll to the cotton within. It was first suggested by Mr. Robson that there was some connexion between the disease and the occurrence of cotton stainers. The experiments which had since been carried out proved that there is a necessary connexion between cotton bugs and internal boll disease. This had been demonstrated by both Mr. Robson in Montserrat, and Mr. Harland in St. Vincent. Mr. Nowell went on to say that the disease and its transmission were of very great scientific interest. In nearly all cases examined by him there was present a particular fungus with very peculiar and distinct characters, though in some cases bacteria only were found to be present. The present information was, he said, that the disease was always associated with the fungus or with bacteria, and that the disease does not occur unless there have been cotton stainers or other bugs sucking from the outside. The exact way in which the organism obtains access was not yet definitely known, but it was probable that it is carried by the cotton stainer. From a practical point of view, the control of the disease was obviously bound up in the control of plant-feeding bugs, especially of the cotton stainer: no bugs, no internal boll disease. Mr. Nowell added that in Barbados, where the cotton stainer does not occur, he had found internal boll disease associated with the green bug.

Mr. Ballou then proceeded to make a few remarks concerning the cotton stainer problem. He had to confess that the control of cotton stainers was at present inadequate. For a considerable time certain treatments - hand collection, water and kerosene, spraying the young stainers early in the season, putting down trap heaps—had been tried with a certain amount of success, but something more was necessary before there could be anything like satisfactory control. With regard to the life-history of the cotton stainer, Mr. Ballou said there was only one point in respect of which there was some doubt, and that is the exact place, under natural conditions, where the female lays her eggs. The cotton stainer, Mr. Ballou said, was one of the few groups of insects of which scarcely a single natural enemy was known, but recently one had been reported from Peru. As regards control, Mr Ballou thought that the destruction of old cotton bushes, and particularly the destruction of the wild plants on which stainers feed when there is no cotton were the most likely ways of keeping down the pest.

Considerable discussion then followed in connexion with these last two points. Hon. R. L. Warneford (Antigua) said that he had experienced sudden invasions of the cotton stainer, and he believed that in his district they came from trees known as Gamboge (*Thespesia populnea*) which grow on the seashore. Mr. Maloney said that in Nevis after the cotton crop has been gathered, stainers are seen on the physic nut tree. Mr. K. P. Pencheon (Montserrat) said that, in his opinion, the only way to destroy the cotton stainer is to destroy the wild plants on which they feed and the old cotton thoroughly, and have a close season. A great deal had been done in Montserrat in this direction, more perhaps than was generally realized. Mr. Pencheon said that Mr Howes had had a good deal of experience in controlling the cotton stainer. In regard to Mr. Nowell's remarks, Mr. Pencheon asked whether bolls could be infected by needle pricks as well as by the sucking of the stainer, in other words, whether it was definitely proved that the stainer carried the disease, or whether disease got into the boll after the puncture was made.

The President said he thought it was conclusively proved that the puncture of the boll by plant-sucking bugs results in boll rot, and the practical point was that the planter had to destroy the thing which punctured.

Mr. Howes (Montserrat) said that about three years ago they had experienced on his estates invasion

of cotton stainers during very nearly all the planting season. He endeavoured to discover what kept them away from previous crops. In the district, trees known as the Gamboge or Seaside Mahoe were found serving as sources of food supply to the stainer, and every effort was made to destroy these plants. Another plant on which the strainer lived in Montserrat was the Hibiscus, known in Montserrat under the name of Twelve o'clock. On these, Mr. Howes said, cotton stainers could be found every day in the year. Mr. Howes had collected strainers by means of a cotton seed bait trap, killing the strainers afterwards in boiling water. The trap was set at night. In the day time it is necessary to cover it over, as the stainers do not like the sun.

Mr. Sampson said that in Nevis the cotton stainer was carried from year to year through the peasant proprietors allowing their old cotton to stand over. He considered there ought to be some legislation making the destruction of cotton trees at the end of the season compulsory. In answer to a question put by the President, Mr. Sampson said that old cotton bushes could be found at the present time, that is to say, outside the cotton season, with stainers upon them.

Hon. J. S. Hollings (Nevis)) said that he did not consider any Government was justified in making the destruction of cotton bushes compulsory, provided they were yielding to the planter a satisfactory crop. In order to obtain good yields he depended upon a lengthy picking season or perhaps planting late. Mr. Hollings had obtained success by the hand collection of stainers

Mr. Harland (St. Vincent) said that most of the stained cotton shipped from St. Vincent was due to internal boll disease, and that the percentage of stained lint was increasing from year to year. With regard to hand-picking of cotton stainers, his personal experience was that in St. Vincent it is not effective. For one reason, the amount of labour was not adquate. Mr. Harland said that he did not think it was the number of stainers that mattered so much as the extent to which they were charged with the disease. At the present time in St. Vincent, it seemed that the new generation of stainers was not so virulent as the previous one. He was extremly pessimistic about the value of hand-picking as a measure of controlling internal boll disease. It was true that hand-picking kept down the number of stainers, but it did not lessen the amount of disease. Dr. Tempany (Leeward Islands) referred to an epidemic of cotton stainers in 1913, and called attention to the fact that the point had been raised that stainers are kept under control by parasitic mites. He expressed agreement that the most satisfactory way of keeping down stainers was to have a close seasen for cotton, and to destroy the wild plants on which the stainers feed.

Mr. Shepherd (St. Kitts) asked whether it is possible to have cotton stainers without the presence of boll rot. Mr. Shepherd had seen cotton stainers very prevalent in St. Kitts, but had not come across the internal boll disease.

Mr. Nowell, in reply to the questions that had been asked in regard to the infection of bolls, said that he had received bolls from Mr. Robson which had been pricked with a needle, and although there was a certain amount of staining of the lint around the puncture, this staining was, as far as he could find out, purely mechanical, and not due to infestation with any organism. Mr. Nowell called attention to the fact that puncture by the setae of the stainer causes proliferation, that is, a kind of warty growth on the inner wall of the boll. Internal boll rot always starts from such a point. On the other hand, these proliferations can be found without any boll disease, showing that some stainers may carry the disease and some may not. Mr. Nowell referring to Mr. Shepherd's question, said it was of great interest that the disease was not bad enough to merit serious attention in St. Kitts. In Montserrat and in St. Vincent, the disease was very bad at certain times and places, and yet in St. Kitts it was not noticed. No explanation of this could be given at present.

The President then said that would close the discussion for the present, so far as pests and diseases of cotton were concerned, and that the Conference would adjourn until 10 a.m. the next morning, when questions relating to the Commerce of Cotton would be brought for up consideration.

THE BRITISH COTTON GROWING ASSOCIATION.

The One Hundred and Forty-Seventh Meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday, May 2. In the absence of Lord Derby, the President, Mr. J. Arthur Hutton occupied the Chair.

WEST AFRICA. The purchases of cotton in Lagos to April 30 amounted to 6,648 bales, as compared with 1,880 bales for the corresponding period of last year, and 10,880 bales for 1914. In Northern Nigeria the purchases to April 22 amounted to 9,287 bales, as compared with 282 bales to the end of April last year, 331 bales to April 30, 1914, and 1,271 bales to April 30, 1913.

In view of the consequent heavy demand on the ginning capacity at Zaria, it was decided to immediately put in hand another ginnery at an estimated total cost of £25,000, in order to be prepared for a larger production in 1918. Owing to transit difficulties it was feared that there would be considerable difficulty in shipping cotton from West Africa to Liverpool.

UGANDA. There is considerable delay in transporting cotton from the interior of Uganda to Mombasa, owing to the congestion on the Government railway, but there is reason to believe that the railway will be in a position to deal with this difficulty at an early date.

NYASALAND. With regard to the proposed extension of the Central Africa railway from Blantyre to the Lake, a petition has been signed by the leading companies interested in the development of Nyasaland and North-Eastern Rhodesia, that the line should be extended along what is known as the Central route, which would not only pass through the most fertile and most cultivated districts in the Protectorate, but would at the same time offer the most direct line to Lake Nyasa, and would afford the best possible outlet for the Lake traffic and for North-Eastern Rhodesia. The planters in Nyasaland are generally in favour of this route, and the Association have decided to support the petition. By the other route which has been advocated in some quarters, the railway would be extended along the eastern side of Nyasaland, close to the Portuguese border, and although it would be the cheapest line to construct, it would pass through comparatively poor land from an agricultural point of view.

GENERAL. Statement of sales of cotton made by the Association during the month was submitted, showing that 1,328 bales had been sold during April.

It was reported that Mr. Horsley, the Association's Manager in Uganda, had recently forwarded 4 bales of cotton, which were a part contribution by the natives of the Eastern Province of Uganda to the Prince of Wales' Fund. The contribution has been made through the Provincial Commissioner, and the Association agreed to pay the rail and ocean freight, in order that the full proceeds might go to the Fund. The Association were anxious to secure the highest possible price for this cotton, which was put up for sale by auction, and ultimately realized 25 guineas per bale, giving a total sum of 100 guineas for the Fund.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number contains some suggestions with regard to efficient legislation against plant diseases.

An important botanical article will be found on page 179 dealing with the identity of West Indian sour grasses.

Another interesting note is that on page 189 dealing with the poisonous nature of chlorate when used in manures.

The discussion on cotton pests and diseases at the recent Cotton Conference will be found summarized on pages 182 and 183.

Insect Notes in this issue concern the dispersal of leaf-blister mite of cotton.

Encouragement of Corn Cultivation in St. Vincent.

In our last issue but one, we gave an account of a Maize Show which was held a short time ago in Antigua with the object of stimulating growers to increase their acreage under corn. The Agricultural Department in St. Vincent also is making efforts to get a larger area under Indian corn in that island. This object has been furthered by issuing a small pamphlet entitled, How to Grow Indian Corn or Maize in St. Vincent. The information is presented in good form, and is of a practical character such as would be likely to prove useful to the practical grower. The various points dealt with include the variety to plant, selection of seed, time to plant and planting distance, sowing of seed, intercultivation, harvesting and preparation for export. Besides this, space is devoted to insect pests and diseases. The pamphlet should serve a useful purpose, and will probably be found valuable in islands other than St. Vincent. The pamphlet is a revision of a similar one issued during March 1915.

The Grenada Scholarship.

The Grenada *Government Gazette* for April 1 last, contains the draft of a bill for an Ordinance entitled, 'An Ordinance to provide for the establishment of the Grenada Scholarship'. The Bill provides for the establishment of one scholarship to be opened to public competition each year; the scholarship is made tenable during membership of any University or College in Europe or Canada, or any Agricultural, Scientific, or Technical College or Institution in Europe, Canada or the United States of America, approved by the Governor-in-Council; it shall be of the annual value of £175, and tenable for not less than three and not more than five years, at the discretion of the Governor-in-Council. It shall be open for competition to every person who produces proof that he will not have exceeded twenty years of age, on the first day of the month in which the examination is held, and who is either a native of the Colony or the child of parents, one of whom has had his, or her, permanent residence in the Colony for the ten years immediately preceding the examination, or of parents who have resided in the Colony for the ten years immediately preceding the examination, or is the child of parents one of whom has died in the Colony, if such child has resided in the Colony ten years previous to the examination. It is also provided that the candidate must, for five years immediately preceding the examination, have been bona fide receiving his education in Grenada and have passed the Junior or Senior Cambridge Examination in Honours.

The scholarship will be awarded on the results of the Cambridge Senior Local Examination to the competitor who is reported by the examiners to have the best claim to be awarded the scholarship.

Similar provisions for an open scholarship exist in the Leeward Islands.

The Colonial Journal.

In the *Colonial Journal* for April 1916 are contained several editorial notes of interest. Amongst the matters given prominence is the question of trade after the war; and in regard to the widespread feeling that the war should be followed by commercial arrangements with the allies and our autonomous possessions, to the exclusion of Germany, it is pointed out that this feeling is the outcome not only of the profound resentment which has been caused by the enemy's military methods, but also of the recognition of the fact that wherever German trade has gone, it has been accompanied by an insidious political organization; and the proper view, it is submitted, to be taken is that, although economic beliefs remain the same, the question has ceased to be purely economical, and that other factors come into play. In support of this view the finding of the Board of Trade sub-committee is quoted, viz: 'That there exists a strong desire to respond to the feeling in our Dominions in favour of an Imperial preference in trade, and that there is also a strong desire to arrange preferential trading with those who are our allies in the present war.'

A new prospect is said to be opened up for the Bahamas by a suggestion that the deposits of seaweed should be exploited for the purpose of producing potash compounds from seaweed. The current shortage of potash compounds has assumed most serious dimensions, as is seen from the fact that the ordinary commercial chloride of potash (80 per cent. muriate of potash) is now quoted in America at $600 per ton: the rate in July 1914 was $38. Attention has been directed to the possibility of exploiting deposits of seaweed which are present in abundance in the so-called Saragassa Sea of the Central Atlantic. Vast amounts of this seaweed are thrown up on the coasts of the Bahamas. In one harbour, the accumulations of hundreds of thousands of tons render navigation at times impossible. The dried kelp obtained from this seaweed is said to contain, on an average, 9 per cent. of potash.

In regard to the increased consumption of sugar in England, it is suggested that the increase is not altogether real, but is largely due to the manufacture of chocolates and other sweetstuffs which used to be imported from abroad.

Reference is also made to the increased prices now obtaining for West Indian sugar, but in this connexion it is pointed out, however, that the replacement of beet by cane sugar is being effected chiefly by Java and Cuba; in the latter island there has been a huge increase of production, so much so that the coming season is expected to see 600,000 tons more than the last. This, it is observed, is a sample of American enterprise, in which up-to-date machinery plays a great part. And West Indian planters, who are said to be enjoying a good time, and, in some places, 'spending money with the lavishness which usually accompanies a sudden rise of income', are reminded that generally after a rise comes a fall, and that continental beet will again be in the market.

Influence of Temperature on Soils.

A paper on soil physics of some importance has been issued by the Michigan College Experiment Station as Technical Bulletin No. 22, entitled, Effect of Temperature on Some of the most Important Physical Processes in Soils. Temperature being a dominant soil factor in the tropics, the results contained in this Bulletin should be noted in the West Indies. Amongst the conclusions arrived at is one that the capillary movement of water in moist soils is not controlled entirely by the curvature of the capillary films, as is generally believed, but also by the unsatisfied attractive forces of the soil for water. Again, it is believed that the amount of water lost from the soil by water vapour is very small; there is no rising of vapour during the night from the warmer soil below to the cold soil above; and the source of water of the dew is not derived from the soil vapour as is commonly believed. Results have led to the conclusion that temperature has a very marked influence on the conservation of moisture by mulches. Temperature is stated to have a tremendous influence upon the aeration of soils.

New Marine Industries for the West Indies.

A note in *The Wealth of India* for February 1916, calls attention to the desirability of developing the minor marine industries of Madras, which are said to possess undoubted potentialties, if systematically organized. These industries are—pearl fishery, shell coral, and bêche-de-mer collection, turtle breeding, cultivation of seaweed for vegetable gelatine, and so on. This is of interest in connexion with similar views put forward by the Imperial Department of Agriculture in regard to the shallow-water resources of the Lesser Antilles, in a recent issue of the *West Indian Butletin* (Vol. XV, No. 2), under the title of A Method of Sponge Cultivation. This article called special attention to what has been done in the Caicos Islands near Jamaica in the matter of growing sponges from cuttings, and in regard to lobster canning, the raising of turtle, and the collection of conch shells.

The latest issue of the *West India Committee Circular* (for May 4, 1916) states that consignments of canned lobster and conch shells have been shipped from Caicos to the United States during the month of February 1916, and further consignments are at Grand Turk awaiting shipment. The Caicos Development Company report that the area of sponge they have under cultivation is progressing favourably, and that they are still engaged in putting down more.

It would seem that experiments in the shallow-waters of the Lesser Antilles would be well worth while, considering the small expense and great possibilities involved.

INSECT NOTES.

THE DISPERSAL OF LEAF-BLISTER MITE OF COTTON.

The leaf-blister mite has been known as a pest of cotton since July 1903, when it made its first appearance in Montserrat. There seems to be no doubt that this mite lived upon some wild plant before the revival of the cotton industry, but this has not been proved by the discovery of such a food plant. The leaf-blister mite appeared in all the islands of the Lesser Antilles very shortly after its first discovery, except in Barbados where it was discovered only as late as 1912, although the indications at that time were that it had existed for some two or three years without being recognized.

The means by which the leaf-blister mite is spread has never been definitely settled. It has been believed that birds and insects and even the wind may have been agents responsible for its distribution, and it has been believed that the mite has also been transported from place to place along with cotton seed.

When this pest was found to be established in Barbados a careful survey of its distribution in that island was conducted by the local Department of Agriculture, as a result of which it was found that the centre of worst infection occurred along the Leeward coast some 5 or 6 miles north of Bridgetown, and that at the extreme northern and southern ends of the island it was not to be found; and the same is true of the central and south-eastern cotton-growing districts. This showed a definite area of introduction from which the infestation had spread. It was not a general outbreak such as was seen in the other islands in 1903 and 1904.

In 1914, while observations on the leaf-blister mite were being made in the Laboratory of the Imperial Department of Agriculture, it was seen under the microscope that the full-grown mites had a tendency to ascend to the tips of leaf hairs and assume what appeared to be a waiting position with the legs of the first pair extended as if to attach to any moving object which might come into contact with them. When a hair from a camel's hair brush was brought into contact with these insects, it was immediately grasped and the mite loosened its hold on the leaf hair and allowed itself to be carried away. This habit and position is exactly analogous to the habit and position of larval ticks which climb grass and other herbage and attach themselves to cattle and other animals which come in contact with them in passing. Any leaf-blister mite in this position would attach itself to an insect or bird and be carried away. It may be stated also, that at certain times when the mites are crawling about on the surface of the leaves and twigs in considerable numbers they might easily crawl on to the feet of any bird resting for a moment on the plant.

The following note illustrates the dispersal along with seed.

Early in the present year an officer of the Imperial Department brought from another island a few seeds of cotton in an envelope. Some time afterwards two of these seeds were planted in soil in concrete tanks covered with carefully built cages of fine mesh wire, so that none but the very small insects could have access. No cotton had been grown in these cages before and no cotton is grown in the district.

The first leaves of the plants from these seeds showed the characteristic signs of leaf-blister mite attack, and all the secondary growths have likewise been infested, although the first infested leaves were picked off and burnt as they appeared. There seems to be no possibility that the leaf-blister mite could have found its way to these plants but by means of the seed, coming with it from the island in which it was grown.

As a safeguard against the introduction of the leaf-blister mite into cotton fields with the seed used for planting, the disinfection of the seed in a solution of corrosive sublimate 1 part, in water 1,000 parts, or roughly 1 oz. of corrosive sublimate in $6\frac{1}{4}$ Imperial gallons of water is recommended for general practice.

This treatment has been extensively used by cotton planters in the past as a general means of disinfecting cotton seed and destroying fungus spores that may be present; and now when it seems to be proved that the leaf-blister mite can be introduced with the seed, there is greater reason than before for this disinfection.

Reafforestation in Queensland.—The following outline of an Act has been prepared for dealing with the question of sustaining the Queensland forests in vigorous growth:—

'Every person owning land to the amount of 10 acres or more shall retain, plant, or cause to be planted, not less than $2\frac{1}{2}$ per cent. of the whole in forest trees. The trees selected shall be at the owner's discretion, provided that under normal conditions they may be expected to attain a height of not less than 20 feet and 1 foot in diameter of trunk. Stone and pip trees excluded. The method of planting and reservation may be either as shelter belts, plantations, clumps, or isolated specimens.

'For computation, the following number of trees may be considered equivalent to a $2\frac{1}{2}$ percentage: Isolated specimens, an average of not less than three to an acre; clumps (three trees or more, not less than 6 feet apart), an average of six trees per acre; plantations or shelter belts, an average of not less than seventeen trees per acre planted 4 feet apart or more—equal in all to an average of one tree per 8 feet square to area planted.

'In plantations and shelter belts measurement of area may also be resorted to: in that case the measurements shall be taken 6 feet from the trunk, outside the line of trees, etc.

'There would be several other clauses necessary, defining the ownership of the trees, prevention of planting evergreen species within a chain of public road, distance from boundaries, *re* possible nuisance or damage, etc., too numerous to mention here. The Government should also assist by publishing leaflets descriptive of suitable trees, their treatment, requirements, etc. They should also obtain seeds of the most useful kinds, and at cost price to bona fide planters.'

Cassie and its odour forms the subject of an interesting article in the *Perfumery and Essential Oil Record* for March 1916. Cassie pomade has been made for many years from the blossoms of *Acacia Farnesiana*. This species is widely distributed throughout the tropics and is regarded as a native of the West Indies. It appears that the flowers have better odour when grown in sub-tropical climates. The pomade is prepared by the maceration process by digesting the flowers in melted fat. This process was described in a recent issue of the *Agricultural News*. Other species of Acacia have a similar odour to the flowers of *A. Farnesiana*, notably, *A. Bertoloni*, *A. Cavenia*, *A. dealbata*, a native of Australia, and several others. The article gives the chemical and physical characteristics of the essential oil which produces the odour.

CORN CULTIVATION.

The following information is reproduced from the Report on the Botanic and Experiment Stations, Antigua, for 1914-15.

TILLAGE EXPERIMENTS.

These experiments were laid out with a view to obtaining information as to whether surface tillage operations would prove remunerative if performed regularly on land growing maize. The question of moisture conservation as brought about by means of a frequent breaking up of the soil surface has often been brought forward in Antigua, especially in connexion with sugar-cane cultivation.

Seeds were sown in $\frac{1}{10}$-acre plots at distances of 1 foot × 4 feet on February 21, and in each case two plants were left in each hole. The plots were harvested on June 16. The tillage accorded to each plot was as follows: Plot No. 1 was tilled weekly; Plot No. 2 was tilled fortnightly; Plot No. 3 was not tilled.

The tilling was done by means of hoes, and during each operation the land was thoroughly loosened.

The yields obtained were as follows:—

	Yield per plot unshelled corn, in lb.	Calculated yield shelled corn, in lb.	Calculated yield per acre shelled corn, in bushels.
Plot No. 1	181	1,357	26
Plot No. 2	172	1,290	23
Plot No. 3	124	930	16

In converting the return of unshelled corn into terms of shelled corn, the normal local allowance of 75 per cent. is made; 56 lb. are reckoned to the bushel.

The results obtained are interesting, and indicate that increased yields may be expected from lands receiving regular surface tillage. Although the yields obtained are by no means high, yet the difference between No. 1 plot and No. 3 shows an increase in favour of the former of 61 per cent.

When considering the result from a trial of a nature similar to this, the actual cost of the various operations taken in conjunction with the yields obtained should not be lost sight of.

In the following table the value of the cultural work is based on estates' rates, and the cost of the tillage operations per acre subsequent to planting may be taken as follows:—

	Cost per acre per month.	Cost per acre for four months.
	s. d.	£ s. d.
Plot No. 1	5 4	1 1 4
Plot No. 2	2 8	10 8
Plot No. 3	...	...

It may be pointed out, with reference to the charges given in the above table, that the work would have been more effectively performed if harrows had been used, and the cost would have been much less. In this connexion it may be stated that one man can in one day till from 3 to 4 acres with a Planet Junior harrow; for such work he would receive from 1*s.* to 1*s.* 6*d.* per day.

The following calculations show the value of the produce reaped per acre, after deducting the cost of tillage:—

	Calculated value of corn, per acre.	Calculated value of corn after deducting cost of tillage operations.
	£ s. d.	£ s. d.
Plot No. 1	5 10 6	4 9 2
Plot No. 2	4 17 9	4 7 1
Plot No. 3	3 8 0	3 8 0

In the above, the corn is valued at 4*s.* 3*d.* per bushel. The figures indicate that weekly tillage gives the most economical results.

DISTANCE PLANTING EXPERIMENTS.

On account of maize being grown locally as a catch crop with sugar-cane, some uncertainty exists as to the maximum number of plants that can economically be matured on 1 acre of land.

As will readily be seen, this involves such factors as soil fertility, rainfall, etc, which necessitate modifications to suit different localities.

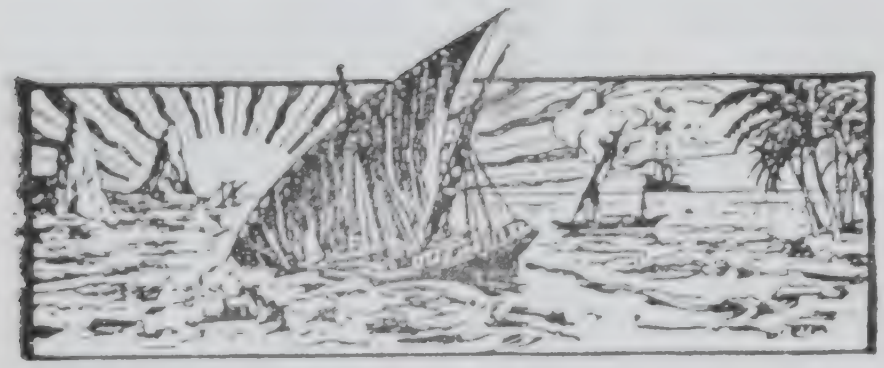
Unfortunately all the plots were not planted at the same time, but in spite of this, the results are of interest.

In every case two plants were left in each hole. The results obtained are given in the following table:—

No. of plot.	Date of planting.	Distance.	Yield of unshelled corn per plot, in lb.	Calculated yield of shelled corn per acre, in lb.	Calculated yield per acre of shelled corn, in bushels.
No. 1	Sept 22	6 in × 6 in	84	1,260	22
,, 2	May 9	1 ft × 1 ft	83	1,245	22
,, 3	Aug 29	4 ft × 4 ft	52	780	14
,, 4	,, ,,	1 ft × 4 ft	51	705	13

There was practically no difference in the returns obtained from the first two plots, but the quality of the corn reaped varied considerably. A large proportion of that obtained from plot 1 was indifferent, and the cobs could only be classed as 'nubbins'; those reaped from plots 2,3 and 4 were normally good. No good ears were reaped from plot 5—in fact nothing worth recording was obtained. It will be seen that 1 foot × by 1 foot is the best planting distance.

Concerning the manufacture of hydrosulphite of soda, which is used for bleaching sugar in factories, the *International Sugar Journal* for April 1916, provides the following interesting information. Since the outbreak of war, the salt in the form of powder appears to have been unobtainable; however, a well-known French chemist has now evolved a process which can be installed in the sugar factory or refinery for the manufacture of the bleaching agent in the state of solution ready for use. The plant is stated to be comparatively simple, and for its operation the services of an intelligent workman only, are required. The article containing the above information is accompanied by a plan of the plant.



GLEANINGS.

Volume VII, Part 3, of the *Journal of Agricultural Science*, contains a series of important papers by Rothamsted investigators on the formation and translocation of carbohydrates in plants. These are of great chemical interest, and will prove useful to investigators interested in the subjects dealt with.

A review of a book called 'The Tropics', by C. R Enoch, appears in the *Journal of the Royal Society of Arts* for March 24, 1916. This is described as containing a great amount of information, carefully put together, and as being rich in suggesitons as to the further development of the various countries described.

In regard to the amount of effective arsenic in cattle dip, it is stated in the *Rhodesia Agricultural Journal* for December 1915, that in calculating the strength of a dip half the arsenate of soda has to be deducted, since this substance has, as far as present knowledge goes, only half the quick killing power of arsenite.

A useful table showing the digestible food units and prices of feeding stuffs is to be found in the *Journal of the Board of Agriculture* (England) for March 1916. This list contains most of the principal tropical feeding stuffs like coco-nut cake, palm nut kernel cake, ground nut cake, rice meal, and cotton seed meal. Palm nut kernel cake appears to be one of the cheapest feeding stuffs, but its digestible food units are low, namely 90·5 compared with 145 for ground nut cake, which is one of the highest.

Useful information as to the principal cultivations in the different wards of Trinidad is contained in Council Paper No. 9 of 1916. In Arima, cacao is the chief staple, with coffee and some rubber. In Couva, sugar-cane is principally grown. Sangre Grande is well known for its cacao though rubber is rapidly increasing. Cacao is the chief crop in Montserrat as it is also in Oropuche and La Brea. In Naparima there is about an equal area under cane and cacao.

The sugar crops and exports in regard to Brazil are dealt with in a note in *The Board of Trade Journal* for February 17, 1916. The sugar crop for 1914-15 amounted to 716,000 bags of sugar, of which by far the largest amount was sent to the United Kingdom, being another example of the great demand for cane sugar during the past year. The crop for 1915-16 is expected to be a late one, and smaller than the previous crop.

It is reported in the *Australian Sugar Journal* for March 9, 1916, that the Queensland sugar crop for 1916 has been estimated by the General Superintendent of the Bureau of Sugar Experiment Stations at about 180,000 tons, provided the remainder of the growing season is favourable. This would be considerably in excess of last year, when a drought occurred, but would fall far short of the crop for the record year of 1913. Exact figures will be available in July next.

The Agricultural Experiment Station at the Kansas State Agricultural College has issued a Bulletin (No. 205) on corn growning. This deals, amongst other matters, with the respective merits of the two methods of cultivation, namely, listing, and surface planting. The former is adapted to regions having limited rainfall and light types of soil. The latter is adapted for conditions tending towards an opposite extreme. The bulletin contains, as well, useful notes on the storage of corn, and on insect pests of this crop.

An interesting article on cloves, their history and distribution, appears in the *Perfumery and Essential Oil Record* for January 1915. It appears that the French have done much in order to introduce this tree into different parts of the tropics. They carried it to Mauritius and to their western colony of Cayenne. It is not generally known that the French have successfully introduced cloves into the French Congo, where the tree flourishes in several places in the Gaboon. It appears that the tree has not flourished in Cayenne.

Breeders of ducks in the West Indies should procure a copy of *Farmer's Bulletin*, No. 697, issued by the United States Department of Agriculture. This deals with the different aspects of duck raising, selection and methods of feeding receiving special consideration. As is well known, ducks may be fed on the rations recommended for fowls and chickens, but better results are usually secured by feeding more green and vegetable feeds and a larger proportion of mash. The bulletin is well illustrated to show the different breeds of ducks and the different kinds of houses for keeping them in.

The war and its relation to rubber planting was dealt with in an interesting article in the *India Rubber Journal* for February 5, 1916. It is stated in this that the supply of plantation rubber will be more than doubled within the next five years. As regards demand, it is thought that this will remain steady, the big war demands being more or less conterbalanced by the reduced luxury demand. Another article in the same journal for January 22, deals with rubber production and prices in 1915. Figures show that the world's total production in 1915 was 146,000 tons, compared with 80,000 tons in 1910.

AGRICULTURAL ACTIVITIES IN GRENADA.

Copy of a progress report has been forwarded to this Office by Mr. J. C. Moore, Superintendent of Agriculture, Grenada, on the work of the Agricutural Department for the quarter ended March 31, 1916.

Operations in the Botanic Gardens were chiefly in the nature of ornamentation, and formation and preparation of nursery beds for planting. Horse beans were sown throughout a plot of land in the orchard in which budded grape fruit trees had recently been planted. The value of this bean as a soil cover and renovator, as well as for producing organic mulching material, and keeping down weeds will be referred to in the next Annual Report. In the meantime, seeds are being distributed from the experiment stations, and efforts are being made to encourage the use of this plant in Grenada.

The scarcity of suitable land in the Gardens for such nursery work as the raising of limes, budded mangoes, citrus fruits, coco-nuts, etc., has been met by the Board of Agriculture agreeing to the Superintendent's proposal to reduce the area under cacao. A plot of the younger cacao will be reserved. The work of preparing the additional nursery land has been begun by the removal of some of the cacao and immortel trees, and will be continued as is found necessary.

Plants distributed during the year ended March 31, 1916, included: Limes 26,456, coco-nuts 9,689, shade trees 850, cacao 500, various economic and ornamental 362; besides 2,000 seed coco-nuts, and 630 lb. horse-beans. This constitutes a record distribution for plants raised in the Botanic Gardens' nurseries, and indicates a satisfactory extension of the area under permanent crops other than cacao, in the island. Extensive preparations have been made to provide for this section of the Department's work during 1916-17, including a promising stock of about 30,000 limes.

Regarding the experiment plots, in addition to the routine work of weeding, etc. the limes at Morne Rouge were pruned by the Agricultural Officers. Pruning, though seldom required on lime trees, was in this instance necessary, and consisted in removing only the lower branches touching the ground so as to facilitate the gathering of the crop, mulching and sanitation operations. The sugar-cane planted at Morne Rouge in November last has made good progress and has, so far, satisfactorily withstood the drought.

During the quarter the Superintendent attended a meeting in Grenville of the Agricultural and Commercial Society; two meetings of settlers at the Morne Rouge sugar works, and visited four estates in St Andrew's and two in St. George's parishes; while the Agricultural Instructor visited 213 peasants' holdings, and made, amongst others, fifteen visits to the land settlements and experiment plots at St. Cyr, Westerhall, and Morne Rouge.

The receipts on account of Land Settlements for the quarter amounted to £59 9*s.* 11*d.* The land settlements accounts and records were examined by the Auditor, who expressed his appreciation of the satisfactory manner in which these had been kept since the previous examination.

The weather is reported on as having been particularly favourable for most agricultural operations, the dry season not setting in until about the middle of April.

POISONOUS NATURE OF CHLORATE AS A MANURE.

Last December this Office was informed by the Secretary of State for the Colonies, that it was anticipated that some 1,200 tons per annum of unrefined nitrate of potassium would be available from a certain source, and the question was raised as to whether it would be suitable as a fertilizer. An analysis of the material was enclosed, and this showed that it contained some 6 per cent. of potassium chlorate. Reference to current literature showed that such a considerable quantity of chlorate would be likely to render the material unsuitable for use as a manure, and other uses were suggested for it. More recently the Colonial Office has furnished this Department with more detailed information obtained from the English Board of Agriculture in the form of a report by Sir. James Dobbie, the Board's Chief Analyst. This report includes the results of three series of experiments that were conducted in Germany in 1899, with the specific object of determining the toxic powers of varying quantities of chlorate. The first two series were made on rye. No. 1 series was with chlorate and perchlorate of potash. The general conclusions and results of this series of experiments were: (a) Plots treated with nitrate containing chlorate caused the leaves to become pale and spotted, but there were no symptoms of perchlorate poisoning; the crop showed an increase of 4 to 7 per cent. (b) Plots treated with chlorate and perchlorate without nitrate showed very few symptoms of poisoning; the plants were very weak owing to the absence of nitrate. (c) Plots with nitrate alone gave an increased crop of 31 to 33 per cent. (d) Plots with nitrate containing perchlorate gave a less crop than (c), and showed symptoms of perchlorate poisoning.

The second series of experiments was with perchlorate of soda. Compared with the plots in which nitrate alone was used, the presence of 0·5 per cent. of perchlorate in the nitrate reduced the crop 3 per cent.; 1·3 per cent. of perchlorate in the nitrate reduced it 40 per cent.; while with the 2·68 per cent. of perchlorate in the nitrate the crop was only one-half the size of that from the plot treated with nitrate alone.

The third series of experiments was upon young plants in November. It was found that plots treated with nitrate containing 0·04 per cent. of sodium perchlorate were injuriously affected, but the young plants gradually outgrew the injury. With nitrate containing 2 to 3 per cent. of perchlorate, however, many plants were killed. In the case of potassium perchlorate the plants outgrew the injury even if the nitrate contained as much as 3 per cent. of perchlorate. It is therefore evident that sodium perchlorate is more harmful than potassium perchlorate, and that potassium chlorate is the least harmful of the three substances.

These results clearly indicate that potassium nitrate containing as much as 6 per cent. of chlorate could not be used safely upon plants. It might possibly be used to some extent in compound manures, if the proportion employed was such as to give less than 1 per cent. of chlorate in the mixture. But care would need to be exercised in the selection of constituents of the compound manure, as chlorates cannot be mixed with some substances without action.

EXPERIMENTS WITH TROPICAL CROPS IN CALIFORNIA.

The following extracts have been taken from the Report of the College of Agriculture and the Agricultural Experiment Station of the University of California for 1914-15. The information is of interest in relation to West Indian agriculture:—

FERTILIZER EXPERIMENTS UPON ORANGES AND LEMONS.

During the past eight years the station has been conducting a fertilizer experiment upon oranges and lemons at Riverside. The trees are not yet in full bearing, but already some indication of the trend is becoming apparent. With these young trees distinct effects have been obtained from the use of stable manure, from a complete fertilizer, and from nitrogenous fertilizers. Some apparent effect has been obtained from phosphoric acid, but little if any from potash salts, at least as far as the yield is concerned. In another area of the same type of soil it has been conclusively shown that corn, potatoes and sugar beet were increased by ploughing down a leguminous cover crop over that which was obtained by turning under a cover crop of barley. A leguminous cover crop supplied as much nitrogen to the soil apparently as was supplied by 1,000 lb. of nitrate of soda. In other words, it is not only desirable to supply organic matter to the soil, but preferably this organic matter should be from a leguminous crop.

These investigations have not continued long enough to justify definite conclusions, but the present indications are that steamed bone meal may be wisely added to a young bearing orange orchard if a leguminous cover crop is ploughed under annually, on soils similar to the one on which our investigations have been made. If, however, a leguminous cover crop is not used, a liberal application of nitrogen in some form of low-grade nitrogenous fertilizer, and sulphate of ammonia is indicated.* While the investigations have not thus far shown it, it may be that when the orchard gets under the strain of heavy bearing, potash will also be found useful. This, at least, has been found to be the case with crops in a humid climate. Extended experiments seem to show, beyond a doubt, that there it is possible by means of leguminous crops to keep up the nitrogen supply of the soil, but that phosphorus and potassium must be added from some other source in order to maintain a maximum production.

THE EFFECT OF FERTILIZERS ON SUGAR AND ACID CONTENT OF CITRUS FRUITS.

Young reports that differences in sugar and acid contents of citrus fruits under different fertilizer treatments have been found to be comparatively slight. In general, fruits from plats containing potash alone are slightly sweeter than those from other plats. Phosphoric acid plats range second, and nitrogen third, in sweetness. Fruits from nitrogen plats have uniformly shown a higher percentage of nitrogen. Navel oranges grown on sweet stock have more sugar and less acid than those grown on sour stock.

SUDAN GRASS.

The Sudan grass experiment, started at the University Farm, Davis, in April 1913, through co-operation with the Bureau of Plant Industry, has shown this plant to be a valuable annual forage crop in subhumid sections where irrigation is not practised. In 1914, the average yield of cured hay under irrigation was 7·61 tons per acre, while the average yield under dry-farming methods was 6·61 tons per acre. As a seed crop the average yield with irrigation was 1,643 lb., and without irrigation 1,771 lb. per acre. Additional trials are being made to determine the best methods of seeding and handling this crop. Care must be taken in the purchase of seed, owing to the fact that there is no known method of distinguishing between the seed of Sudan grass and that of Johnson grass.

CLOSE PLANTING OF EGYPTAIN COTTON.

Egyptain cotton, when allowed to grow under ordinary condition, at the Imperial Valley Experiment Farms reaches a height of 6 or 7 feet, with large vegetative branches, which make picking difficult. Different distances of planting were tried and resulted in very striking advantages in favour of close planting. The cotton plants were smaller, with fewer vegetative branches than when planted far apart, and the yield per acre was greater, although the yield per plant was reduced. Most of the cotton was produced on the fruiting branches of the main stock, and very little on the vegetative branches. The same general results were obtained with Durango cotton, although the differences were not so marked. The quality of the fibre seems to be maintained by this method of planting.

*Excellent results have been obtained in the experiments at Riverside with dried blood, and with steamed bone meal which carries a small percentage of nitrogen.

Zebu Crosses in Italy. Results, which are also the first reported in Italy, are given in connexion with crossing Zebus with the Maremma, Romagnola and Perugia breeds.

The zebu bull used, belongs to the Gujerat breed, one of the most esteemed breeds of India; it is about 3½ years old and weighs 1,430 lb. It combines an elegant shape with great robustness and remarkable agility. This bull served 113 cows between November 1912 and May 1914. Of this number only nine remained sterile, or 8 per cent: among them were some Schwyz and Dutch cows.

From an examination of the characters of the crosses obtained from the male Zebu with the Romagnola and Perugia females as well as of those from the Schwyz and Dutch dams, which some farmers have bred out of curiosity, though they had been warned that the Gujerat cows produce only enough milk for their own calves, the writer has been able to collect the following data:—

1. That in all the crosses the characters of the Zebu are dominant where the fineness of the skeleton, the abundance of dewlap, development of the ear, slope of the rump and muscular system are concerned.
2. That the coat-colour and size of horns seem recessive.
3. That in general all the crosses show remarkable agility in their movements and great robustness.
4. That they show much aptitude to produce flesh.
5. That they seem to possess considerable resistance to foot-and-mouth disease; this resistance seems to be due to heredity, as would appear from observations made at the Gorio dairy near Brescia, where a male and a female Zebu of the Gujerat breed which were kept together with a herd of seventy brown Alpine cows were spared by the foot-and-mouth disease. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases.*)

VETERINARY WORK IN INDIA.

Considerable progress has recently been made by the Provincial Veterinary Departments of India in educating the people to believe in the scientific treatment of animal diseases. The numbers of cases treated in hospitals and dispensaries, and by officers on tour, are steadily increasing, and in one province, the Punjab, many private individuals have come forward to establish veterinary hospitals at their own expense, while in the Central Provinces some of the cattle-owners voluntarily deposited the cost of 500 doses of anti-rinderpest serum. At first there was strong prejudice against inoculation, but, according to the Report on the Progress of Agriculture in India for 1913-14, cattle-owners are beginning to look upon it with great favour, and consider it the only satisfactory measure to be adopted against rinderpest. Striking instances of the efficacy of the anti-rinderpest serum were demonstrated at Gaisabad and Chanda in the Central Provinces, where 7,233 cattle were inoculated with no mortality amongst them.

In some of the provinces rinderpest was more widespread than in previous years, and there would have been a great increase in the number of animals inoculated but for an unfortunate break-down in the supply of serum from Muktesar. Large orders for the serum were received from Egypt, the Sudan, and Rhodesia, which had to be set aside; but new centrifuges have been installed at the Imperial Bacteriological Laboratory at Muktesar, and a branch laboratory at Bareilly is being expanded, by which it is hoped that it will be possible to meet the growing demand for serum.

Special endeavours have been made to improve the sheep industry in the Punjab. Breeding experiments, undertaken in the United Provinces with a view to ascertain how far the fleece of the indigenous sheep can be improved, have so far yielded satisfactory results. The introduction of a merino cross has produced a very beneficial effect on both the quality and quantity of the fleece. Similar experiments have also been conducted at Pusa. (*Journal of the Royal Society of Arts.*)

A New Chemical Hygrometer —The following description of a new method of determining the relative humidity of the air is summarized in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* from an article in *The Analyst*, Vol. XL, No. 467, London, February 1915, from which further information may be obtained.

'The method of measuring the relative humidity of the air by the wet and dry bulb thermometers is liable to give inaccurate results under certain conditions, and for this reason investigations have been led to the subject of chemical hygrometry. The present paper describes a simple apparatus for determining the moisture content of the air by volume measurements before and after contact with sulphuric acid, which completely absorbs all water vapour present in one contact; the manipulation is easy, and less than two minutes is sufficient to obtain a reading. In a series of trials carried out over a period of several months, the hygrometer worked most satisfactorily and gave results in very good agreement with those obtained by gravimetric determinations, and by the use of Regnaults's dew point apparatus, while readings taken simultaneously with wet and dry bulb thermometers sometimes showed wide discrepancies.'

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of March:—

The produce markets during April have been, as is always the case at this period of the year, more or less disturbed by the new Budget proposals, which, taken together with the frequent prohibition or limitation of certain imports or exports by the Board of Trade, give an unsettled state to articles containing spirit or sugar such, for instance, as tamarinds. The general tendency, however, with products that come under our special notice has been that of increased demand at advanced rates, as the following details will show.

GINGER, NUTMEGS, MACE AND PIMENTO.

There has been but a slow demand for ginger throughout the month, in the early part of which Sierra Leone was quoted at 44*s.* per cwt. At auction on the 19th, nutmegs were in fair demand at the following rates: 72's 1*s.* 3*d.*, 100's 1*s.* to 1*s* 1*d.*, and 112's 10½*d.* At the same auction, mace was also in good demand at 1*s.* 8*d.* to 2*s.* 1*d.* per lb. Quite at the end of the month large quantities of pimento were reported to have arrived, and sales effected at 3¾*d.* per lb.

SARSAPARILLA.

At the drug auction on the 6th of the month, very limited quantities of sarsaparilla were offered, as follows: Lima 26 bales, 9 of which sold at 1*s.* 7*d.* to 1*s* 8*d.* per lb. for ordinary part coarse; 1 bale only of native Jamaica was offered and sold at 1*s.* 2*d.* per lb. for fair red; 10 bales of Mexican were also offered, but found no buyers; grey Jamaica was entirely absent.

KOLA, LIME JUICE, LIME OIL, CASSIA FISTULA, CITRIC ACID, TAMARINDS, AND CASHEW NUTS.

At the first auction on the 6th of the month, kola was in good supply with 93 packages. Of these, 6 bags of good bright West Indian halves realized from 4¾*d.* to 5½*d.* per lb. Altogether 35 packages were disposed of. At the same sale, 16 hogsheads of brown St. Lucia lime juice were offered, but none was disposed of, being limited at 3*s.* per gallon, which price was maintained at the end of the month. In the middle of the month, West Indian distilled lime oil was firm at 9*s.*, and hand pressed at 10*s.* Some 50 packages of Cassia Fistula were offered at auction on the 6th of the month but found no buyers, being held at 60*s.* per cwt. Citric acid has been advancing rapidly since our last report, rising to 3*s.* 10*d.* at the beginning of the month, and closing at 4*s.* per lb. East Indian tamarinds were in good supply at the first auction on the 6th of the month, 53 casks being brought forward: 30*s.* was the price asked, but none was sold. At the first auction also, cashew nuts were in abundant supply, some 355 packages being offered, but none sold.

MARKET REPORTS.

London.—The West India Committee Circular, May 4, 1916.

Arrowroot—2½*d*. to 4½*d*.
Balata—Sheet, 3*s*. 2*d*., block 2*s*. 2*d*.
Beeswax—No quotations.
Cacao—Trinidad, no quotations; Grenada, 79*s*.; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£34 10*s*. to £35.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—40*s*. to 45*s*.
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £8 10*s*.
Mace—7*d*. to 2*s*. 3*d*.
Nutmegs—9*d*. to 1*s*. 2*d*.
Pimento—3¾*d*.
Rubber—Para, fine hard, 2/10½; fine soft, 2/8½; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 18, 1916.

Cacao—Venezuelan, $16·40 to $16·50; Trinidad, $15·40 to $15·75.
Coco-nut Oil—$1·10 per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c.
Copra—$6·50 per 100 lb.
Dhal—No quotations.
Onions—$5·00 to $5·50 per 100 lb.
Peas, Split—$9·00 to $9·25 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·25 to $7·50; White, $7·50 to $8·00 per bag.
Sugar—Arima, crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 17, 1916; T. S. Garraway & Co., May 16, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$16·00 to $17·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, $85·00; Cacao manure, no quotations; Sulphate of ammonia, $100·00 to $105·00 per ton.
Molasses—No quotations.
Onions—$2·75 to $4·00.
Peas, Split—$10·00 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $3·00 to $3·75 per 160 lb.
Rice—Ballam, $7·30 to 7·60 per 190 lb.; Patna, no quotations: Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·50.

British Guiana.—Messrs. Wieting & Richter, April 29, 1916; Messrs. Sandbach, Parker & Co. May 5, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	63c.
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$24 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9½c. to 10c. per lb.
Dhal—	$6·75 to $7·00	$6·50 to $7·75
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 11c.	12c. to 14c.
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$5·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$6·25 to $6·60
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$4·60 to $4·70	$4·60 to $4·70
Yellow	$5·10 to $5·20	$5·10 to $5·20
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 56c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$5·00 to $7·00 per M
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Science for Protection and Progress.

THE present war has shown that science, like fire, is a good friend but a bad enemy. British subjects especially are learning to realize from the harm it can do, its equal possibilities for good —applied either to productive purposes or for opposing its application for purposes of destruction. The sting of the burn has resulted in an awakening to the fact that we have underestimated the power of science, and consequently have neglected to use it as others have done.

Agriculture is often referred to as a peaceful occupation. In itself it is not really so, but one of continual conflict which will become accentuated as systems become more intensive. The planter has many enemies both animate and inanimate. The more he tries to pit his way of doing things against Nature, to adopt intensive methods, to grow things where Nature never intended them to grow, the harder will be the attainment of success unless he calls in the aid of science. He must study his enemy's tactics and learn to circumvent them, and even in some cases to take the offensive. None will deny that the help of science is keenly sought by the most apathetic in times of adversity: such situations could often be avoided if science were employed systematically. The importance therefore of science in agriculture is that it counterbalances Nature's opposition to man's control of vegetation: and secondly, that it enables him to increase production and modify plants and animals to suit his special requirements. If the planter thinks of science as a means of getting his own way, just as the engineer thinks of it in this light, he will more readily appreciate its value.

Outstanding instances where a nation has had to call in science in defence of its agricultural industries are to be found in the United States of America. It has had to be done in the case of the cotton boll weevil, for example. American cotton is one of the most valuable crops, if not the most valuable cash crop, in the world. If it had not been for vigorous scientific action, its production to anything like the present extent would have been impossible. In the United States, also, we see a strenuous conflict taking place in connexion with the Chestnut diseases, and in

connexion with Citrus canker. These are not mere petty outbreaks affecting districts, but quickly spreading scourges which affect whole States.

In the West Indies we have seen, and continue to see on a smaller, but none the less important scale from the individual's point of view, necessity for similar scientific action. The passing of the Bourbon cane is often cited as an event in connexion with which science came to the aid of the planter. The breeding of resistant seedling canes was of inestimable value, and if this work had not been continued year after year from that time on, it is possible that there might have been a repetition of the crisis. In regard to cotton at the present time, there is need for concerted and scientific action in order to combat the cotton stainer, which is responsible for large losses in certain islands. It was only the extreme loss suffered quite latterly which raised an outcry for the help of science in this connexion; and the results of investigations conducted as the outcome, tend to indicate that within a short time the losses will be considerably reduced. In this particular case it is instructive to realize that the line of attack is a broad one, and not only directed upon the insect itself. Attempts have been made to evolve a particular type of plant having such habits as will enable it to escape the pest, and attempts are being made to eradicate the wild plants on which the pest lives during the period when no cotton is in the fields. From the nature of the trouble it is more or less useless to fight the insect by means of hand-collecting or spraying, or any such methods. A broad outlook on such a situation is the scientific outlook, and the only practical one.

In the production of crops in the tropics one of the most important limiting factors is rainfall and humidity. It may be either excessive or deficient. Enormous areas of land naturally unsuitable have been brought under cultivation with success by the application of science in regard to irrigation and drainage. Egypt would grow nothing without irrigation, and many of the low-lying tropical regions, as for instance the coast lands of British Guiana, little without drainage. Deficient rainfall can also be successfully overcome by dry farming methods, namely the use of tillage to conserve for the crop such rain as falls. Humidity of the air and soil fertility can be increased by leguminous wind-breaks and shade trees. Many of these expediencies have now become so general as to be regarded as matters of ordinary practice rather than of science. But they all originated out of scientific research.

Another instance in which science plays a most important part in tropical agriculture is in connexion with the production of special grades or types of raw material to meet special market demands. Science has done a great deal to improve the uniformity of different grades of plantation rubber; it has made great progress in a similar direction in relation to cotton. By means of breeding and selection it is possible to produce pure types of cotton possessing almost any kind of lint, and in marketable quantities. Progress and changes in the production of raw sugars are all due to the application of science The layman is too readily inclined to consider the establishment of a central factory as merely a question of capital and labour. He scarcely realizes that without much patient investigation and great ingenuity, appliances like triple effects, refining processes, and the general chemical control of a factory would be non-existent.

The various co-operative schemes for the betterment of agricultural conditions are all based on scientific principles. We see this in the arrangements for the supply of sugar-cane to some of the central factories of the Antigua type, and in the onion growers' associations now operating successfully in the Leeward Islands. Economic science has also its application in land settlement and co-operative credit. The Ordinances now in force in the West Indies regarding credit on the Raiffeisen system are all based on established scientific principles. In the future it is hoped that science will enter into legislation more generally.

As already intimated, it is only when something goes wrong that the average layman appreciates science, just as medical aid is only fully appreciated in times of sickness. From a national point of view the British Empire has only realized the power of science through its offensive application by Germany. It would seem the wise course to invoke the aid of science in every line of industry both for protection and progress, and in no line of work is it more necessary than in tropical agriculture.

DEPARTMENT NEWS.

At the request of the Government of Egypt, arrangements have been made through the Colonial Office for Mr. H. A. Ballou, M.Sc., Entomologist to this Department, to proceed to Egypt for the purpose of advising the Egyptian Government on matters concerning pests of cotton. It is anticipated that this mission will occupy a year.

THE BAY TREE AS A CROP PLANT.

The increased interest which has arisen in regard to bay oil has led to a demand for information in a concise form regarding future prospects of the industry, best methods of cultivation to be pursued, mode of procedure likely to give best results in conducting distillations and other general points in relation to the industry. This will be found in the form of an article by Dr. H. A. Tempany and Mr. W. Robson, in the *West Indian Bulletin* just issued (Vol. XV, No. 3).

Regarding the future demand for bay oil, it is stated that, judging from authoritative reports there does not appear to be any likelihood of the demand for the product being exceeded by the supply. In certain quarters active attempts are being made to increase consumption, and in this connexion editorial remarks made in the *Perfumery and Essential Oil Record* to the effect that, having regard to its delightful fragrance, considerable extension of the use of bay oil could be found in soaps and other toilet articles, is of considerable importance There appears to be an opening for bay oil in the perfumery trade as well. In regard to market values, the English price for British West Indian bay oils ranges between 10*s.* and 11*s.* per ℔., c & f. In St. Thomas the price is higher, but that is due to abnormal conditions of supply and demand.

So far as is known, the existing supplies of leaves and oil are almost entirely derived from trees growing in islands like St. Jan, Porto Rico and Dominica, in a state of nature. Dr. Tempany and Mr. Robson suggest that production would be more profitable if the trees were systematically cultivated and planted on plantation lines. Experiments have been made for some years on these lines in Montserrat, and perhaps the most important part of the paper under review is the description of this useful piece of work which has given rise to results of an encouraging nature. It is concluded from observations made as to the yield per acre year by year, that cultivation and proper planting pay.

The method of establishing a bay orchard is described in some detail. The bay tree produces seed during the period June to August in Montserrat, generally in considerable profusion. Bay seeds very soon lose their vitality, and should be sown immediately they are taken from the berries. The most successful method of sowing is found to be in boxes, in a mixture of loam, leaf soil, and sand; though the seed can be successfully raised in suitably prepared beds. The beds, however, must be protected from the sun. Germination takes place in about fourteen days, and the nursing of the plants for the rather long period of twelve months is necessary before they are fit to be planted out into the field. It is important to provide a certain amount of shade for a limited period after transplanting In carrying out this operation, the tap roots of the young plants should be cut with a spade or similar tool six weeks before it is intended to remove the plants, the result of which is the formation of a mat of fibrous roots near the surface. This operation is considered to be absolutely necessary where plants are to be taken directly from the beds to the fields.

As regards the best situation for bay trees, any soil varying from a light to a clayey loam would appear to be suitable; preferably, perhaps, the latter. Though the trees are comparatively hardy, on wind-swept land they are not likely to be a success. On good soils, 9 feet between the rows and 8 feet between the plants will in the long run be found the most suitable distance for planting. This gives about 800 plants to the acre. Experience would appear to indicate that a catch crop of cotton or some other suitable crop can be safely taken off for the first two seasons.

In handling the plantation, the idea kept in view should be to maintain the trees in bush form not exceeding a height of about 7 feet; such a course greatly facilitates the operation of reaping the leaves. After the first two years, cultivation expenses have proved to be very small, and have worked out, on the average, at 16*s.* per acre per annum.

In January 1911, the plan of making monthly reapings and distillations was followed, with the idea of endeavouring to obtain reliable information as to whether the leaves yielded a higher percentage of oil, or oil of better quality, at any particular period of the year. The method of reaping followed is to remove shoots on which all the leaves are seen to be fairly matured, with a pair of ordinary garden secateurs, the leaves being stripped off the shoots subsequently. Only a few shoots are removed from any one tree at a time, and nothing in the nature of stripping the trees is resorted to. It is estimated that one reaper with two women to strip the leaves from the branches, ought to collect 300 ℔. of leaves per day, where trees are grown in bush form as in a plantation. Before distillation it was the custom in this experimental cultivation to dry the leaves for three days in a covered shed. The actual yield of fresh leaves, and the actual amount of oil obtained from them steadily increased each year; for instance, the yield of oil in ounces per 100 ℔. of green leaves steadily rose from 16·2 oz. in 1911 to 19·5 oz. in 1914. This increase is put down to the fact that there was steadily increasing vigilance to ensure that only those shoots were removed on which the whole of the foliage was seen to be mature. The yields recorded as regards oil content appear to compare favourably with data obtained in connexion with St. Thomas.

Leaving the subject of cultivating bay trees, the authors of the paper under review next consider the principal chemical characteristics of bay oil. Bay oil consists of a number of hydrocarbons, of which eugenol and myrcene are by far the most important. The general average chemical and physical characteristics of normal bay oil are recorded.

It has usually been customary to adduce the valuation of bay oils on the phenol content alone, but it is suggested that such a course is not altogether fair, having in view the special characters of the product. In connexion with this Mr. J. C. Umney has written in the *Perfumery and Essential Oil Record*. In this article he suggests that if pains were taken to bulk the oil so as to obtain a uniform product, and the oil sold with a Government guarantee that it is solely the product of *Pimenta acris*, the product would soon find its correct position in the market.

In regard to distillation, the paper provides information to show that the operation is one which requires to be conducted with a good deal of care in order to secure a uniform product, and to avoid waste of important constituents. In view of the fact that in the past the distillation of bay oil in the English islands has been left almost entirely in the hands of the ignorant and careless native workers, it is hardly surprising that the quality of the resulting product has frequently exhibited wide variation in composition.

[This article will be continued in the next issue of the *Agricultural News* in regard to other matters concerning distillation of bay oil.]

THE DEVELOPMENT OF DOMINICA.

The agricultural development of Dominica during recent years has been one of the most remarkable events in the West Indies. This has particular reference to the lime-growing industry of the colony, the annual value of the exports of which has risen from £11,363 in 1892, to £185,895 in 1914.

An instructive article on this subject by Dr. Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, appears in the *West Indian Bulletin* just issued (Vol. XV, No. 3). This article contains a diagram, reproduced on this page, showing annual exports of lime products during the period referred to above. In order that this curve might be constructed the different lime products were expressed in terms of concentrated juice. Upon studying this curve, several points of interest can be made out. In the first place it is seen that the rise in the development in the industry begins quite early in the years under consideration, and progresses rapidly up to the year 1902. During this period the general tendency of the curve representing the industry is already determined; what follows in later years is a continuation of a purpose already determined upon in this early period. Seeing that several years elapse between the time of planting lime trees and the time when results appear in the form of exports, it is to be concluded that the purpose was determined at some period anterior to the increase in exports. As some six years are required for the moderate development of an average lime tree, it may be assumed that Dominica determined upon its policy as a lime-growing community somewhere about the year 1880, and that it has consistently followed it with the results indicated in the diagram.

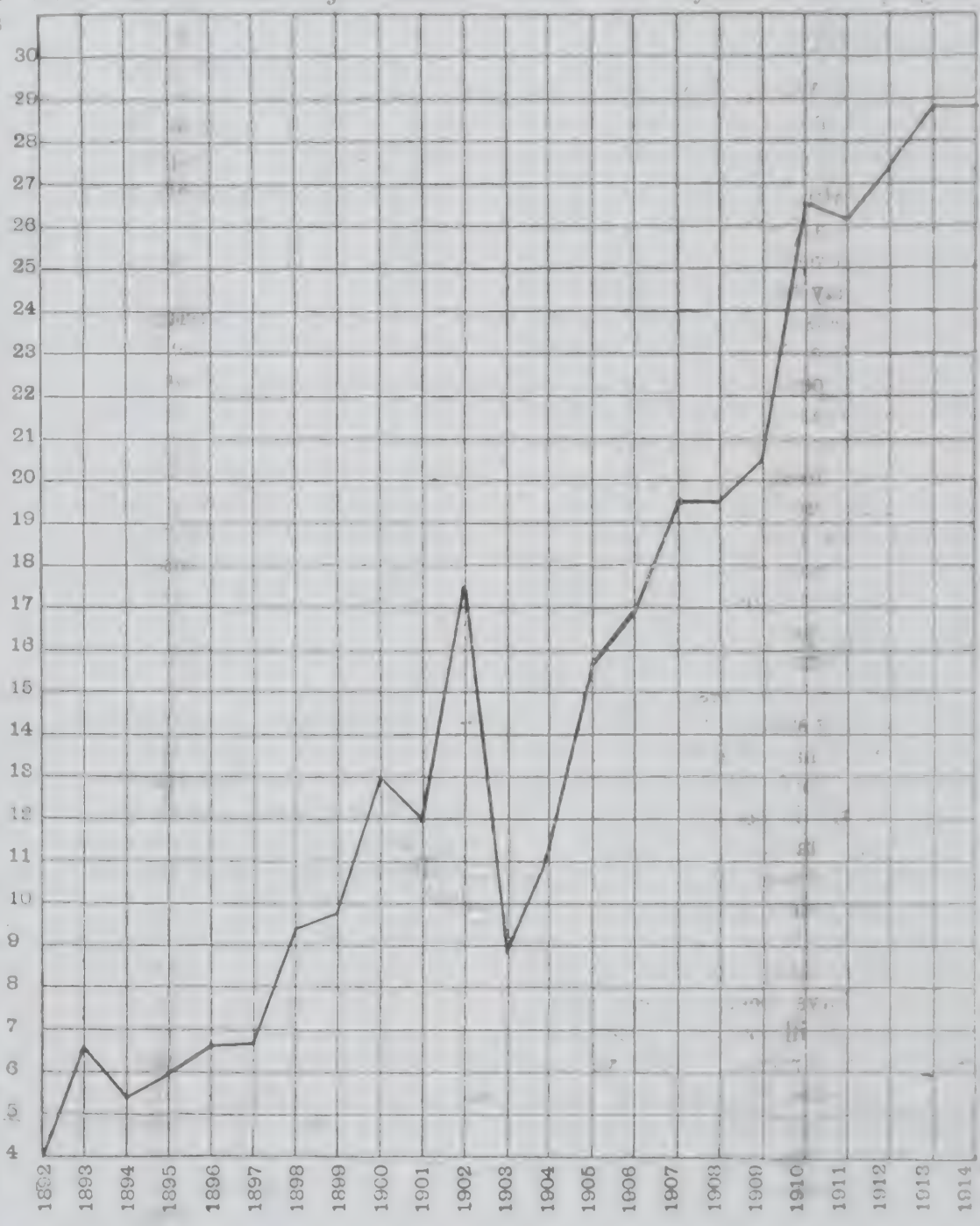


FIG. 9. DIAGRAM SHOWING ANNUAL VALUE OF EXPORTS OF LIME PRODUCTS FROM DOMINICA, EXPRESSED IN TERMS OF CONCENTRATED JUICE.*

The next point that strikes one is that there is a sudden break in the curve after the year 1902, so that the output of the year 1903 is only just about one-half of that of the former year. This is explained by the drought that occurred at this time, which was followed by an alarming outbreak of insect pests, inflicting much damage upon the trees. The extent of the injuries suffered from these causes is well brought out in the diagram. Although the industry showed immediate signs of recovery, it is plainly seen that it only took on a little more than its normal rate of development, so that the effect of this disastrous period is felt for some ten years or more. It may be said that this trying period cost Dominica about five years of its progress.

Progress was however resumed, and continued at about the normal rapid rate until the year 1910, after which, for the last four years, the rate of increase was visibly slackened, though progress has still been maintained at a very high level. Possibly the rate of progress may be determined in these years by the increasing difficulty experienced with regard to labour supply, coupled with some increased expense in obtaining access to new lands. It is only to be expected that a community developing its lime industry some sevenfold will fully employ all its available labour, and will wish, and find it necessary, to attract workers from outside.

A point worth remembering is that as a consequence of the disastrous hurricane which struck Montserrat in August 1899, there was a marked influx of labourers from Montserrat to Dominica at the close of that year; these labourers and their families were familiar with the work of the lime industry and formed a valuable asset to the community which gave them shelter: there is no doubt that in this way the lime industry secured a useful [illegible] which is reflected in the increased output

Even if allowance is made for some retarding of fresh planting and expansion of lime estates owing to the difficulties alluded to, it is to be expected that the output of lime products will continue to show considerable expansion for seveal years to come, for there are large areas of recently planted trees which are steadily coming into bearing. Given a continuation of remunerative prices for lime products, the prosperity of Dominica may be expected to increase still further

The article then goes on to review the development of the cacao industry, the production of which product steadily advanced up to about 1898, after which period progress has been slow; indeed in latter years there has been a tendency

*The figures in the left-hand margin of the diagram correspond with tens of thousands of gallons of concentrated lime juice.

toward a decline. The annual value of the cacao exported at the present time is about £25,000. The article concludes by calling attention to the good prospects before coco-nut cultivation, and to the measure of stability attendant on the lime industry on account of the diverse nature of the different products, each of which meets a separate demand. At the same time, diversity of industries is recommended, and in this connexion it is repeated that coco-nuts offer attractions.

ECONOMIC AVICULTURE.

The following notes on the value of birds in the West Indies for the control of insect pests, have been furnished by the Rev. Father Dawson, S.J., M.A.:—

In these days now that agriculture in all its branches is being reduced, more or less to an exact science, much care and attention are necessarily devoted to the elimination or destruction of such insects as may be found injurious to economic plant life. Habits of insects are minutely studied, and such of these creatures as are found destructive to cultivation are condemned as 'insect pests' and relentless war is made upon them. For each separate insect pest some specific treatment is devised; traps are cunningly laid down, or poisonous drugs are mixed with foodstuffs known to be palatable to the particular insect in question.

Such methods, no doubt, are useful and necessary. But doubtless a campaign more in accordance with Nature's ways might be undertaken. Most of the insect pests, if not all, are the particular prey of some particular bird, and it should be the business of the agriculturist to discover the economic importance of each bird in this respect, for the purpose of introducing and protecting such as may be useful to him. Something in this direction has already been done.

Quite recently the birds of Porto Rico have been studied with this end in view, and the important information thus obtained has been carefully tabulated in a recent American publication (*Birds of Porto Rico*, by Alex Wetmore, Washington Government Printing Office, 1916).

Many islands suffer from a paucity of birds, or birds of the right kind, because hitherto nothing has been done to encourage them to remain: they have been agriculturated out of existence. Before ancient and ill-considered methods of cultivation they have been forced to retire; they have been as it were, elbowed out. In Barbados, for instance, sixty or seventy species of birds visit the island from time to time, but of these only some fifteen species find a permanent foothold; and some of them have only secured this by becoming semi-domesticated.

Birds require cover and convenient water. In England, artificial bowers have been constructed by bird-lovers in several places with the happiest results. The same might be done in these islands, if not for scientific and artistic reasons, at least for economic. These latter are imperative in tropical regions where insect pests if not checked thrive mightily. There are no hard winters to kill them off.

There are in many places great tracts of cultivated land on which not a tree is allowed to grow. There are doubtless plentiful supplies of bird food in the shape of noxious insects, but the birds are only to be found on the outskirts, whereas clumps of trees, carefully selected and planted at convenient distances, and with a supply of water, would induce birds to make them their habitat. There undisturbed they would build their nests and rear their voracious young, and the ground rent of their bowers would be well paid by the inestimable service they would render to the growing crops.

An important question would be to consider what kinds of birds should be encouraged, or even introduced; and here one may only venture to make a few general observations.

Common to most of the islands is one of the several species of boat-tails, Quiscalus, locally known as 'black birds', which I prefer to call 'rudder-tails'. These birds do not visit broad fields in great numbers (where their services would be incalculable), for want of cover. They betake themselves rather to our yards and roads, feeding upon whatever they can pick up, for they are omnivorous. They might be induced to visit the fields if clumps of cabbage palms were planted, and a tap of running water introduced. According to the account mentioned above, all kinds of harmful insects have been found in their crops: grasshoppers, locusts, beetles, bugs, weevils, mole-crickets, cattle ticks, etc.; whereas the amount of corn taken was negligible.

Almost equally important are tyrant birds which include 'logger heads', qu'est ce que'il dit', rain-bird', etc., of which each island has its representatives. Most of these are almost wholly insectivorous, adding, however, lizards and small mammals to their bill of fare. On the other hand, however, they are not gregarious like Quiscalus, nor do they so patiently and persistently forage about the ground for grubs and larvae, preferring to cater their prey on the wing. It may be noted that Elainea (also a tyrant bird) has to a great extent abandoned its pursuit of insects, probably through stress of circumstances, and now feeds almost exclusively on seeds and vegetables. It may be surmised that it feeds its young, at any rate, on an insect diet.

The smaller kinds of gauldings or herons deserve encouragement, for besides fish and crustaceans, these birds will eat great quantities of the destructive mole-cricket. But to introduce them into arable land it would be necessary to construct a shallow trench or stream, for these birds will not ordinarily stray far from water. White egrets, almost equally useful, and indispensable to rice-fields, will go farther afield.

The whole family of cuckoos (Cuculidae) deserve unstinted praise, for their staple food consists of caterpillars. They should therefore be carefully encouraged and protected. Foremost among these in these regions is *Crotophaga ani*, called in some places old-witch or black parrot. These birds hunt most searchingly about trees and fields in groups from seven to twenty, and leave no stone unturned. The islands that do not possess this bird may well lament their loss, and steps should be taken to introduce it; for nothing in the shape of insect pests seems to come amiss to their rapacious maws. In broad fields they would require shelter and water; clumps of bamboos would serve their purpose both for cover and for nesting purposes. Well would they repay care spent upon their culture.

Owls are very useful birds where rats and mice abound. The depredations of these animals in orchards is sometimes quite prodigious. Here the Barn-owl (*Strix flammea*), common throughout the world, might well be introduced; care being taken to provide hollow trees or wooden boxes as places of retirement. Smaller owls will feed on cockroaches, locusts, and such small harmful fry. Goatsuckers and night jars are also useful, feeding on moths and beetles.

The smaller kinds of hawk well deserve attention, for they will eat mole-crickets and locusts with avidity, notably the South American sparrow hawk (*Falco Spaworius*). In this case, besides trees for roosting and nesting, posts or nests should be placed about the fields from which they may ply their useful trade.

COTTON CONFERENCE.

FOURTH DAY'S PROCEEDINGS.

The Commerce of Cotton.

The Conference was resumed on Thursday, March 16, at 10 a.m. In opening this session, the President said the subject for consideration was the Commerce of Cotton. This would involve discussion concerning the methods best calculated to secure reasonable prices for cotton, having regard to the circumstances of production and consumption: also difficulties that have been experienced in the past in connexion with the sale of cotton.

Hon. R. L. Warneford (Antigua) then read a resolution which he had been asked by cotton growers in that island to put before the Conference: 'That the Antigua delegates to the forthcoming Cotton Conference should bring up for discussion, if circumstances permit, the long delays which frequently elapse between the date on which advices of sales of cotton are received in Antigua, and the arrival of the proceeds. The delegates are directed to enquire whether similar difficulties are encountered in other islands, and to endeavour to take some steps which may be calculated to improve conditions in respect of proceeds and account sales'. Mr. Warneford quoted one instance where 29 bales of cotton had been sold in September 1915, while up to March 11, 1916, no account sales had been received. He admitted, however, that this was an extreme case, but pointed out that there always exists a general delay.

Mr. S. W. Howes (Montserrat) said the same trouble was experienced in Montserrat, but perhaps not to the same extent as in Antigua. Mr. K. P. Puncheon (Montserrat) thought that inconvenience was felt more in the case of people who were awaiting account sales to make settlements. In his case when he had been advised of sales, he could make settlements without awaiting accounts from the British Cotton Growing Association. In Montserrat growers could draw on the merchants and no charge was made on the account sales. The position, no doubt, was different in Antigua where the grower dealt through the bank.

Hon. R. L. Warneford asked what would happen if account sales were drawn on, and in the meantime the money was remitted to Montserrat. Mr. Pencheon replied that the draft would be accepted without any hesitation. In reply to a general question put by the President, Mr. J. R. Yearwood (St. Kitts) said he also had experienced delay in the sale of cotton.

The President then asked if it would be sufficient if he wrote to the British Cotton Growing Association pointing out the views expressed, and asking that attention might be given so as to minimize the delay as far as possible.

It was agreed that this would serve the purpose.

Primage.

Hon. R. L. Warneford (Antigua) said he had another resolution entrusted to him, which read as follows: 'That the delegates from Antigua should draw attention of the members of the Conference to the difficulties which are experienced in recovering primage paid on shipments of cotton consigned to the British Cotton Growing Association by growers in Antigua, and to enquire whether similar difficulties are experienced in other islands, and to endeavour to arrive at some means of ensuring a more satisfactory condition of affairs in this respect in the future'. Mr. Warneford complained that the delay in Antigua was excessive; for instance, they had just received primage for shipments made in 1913-14, while primage for shipments made in 1912 still remained unsettled. He explained that primage is a charge of 10 per cent., in some cases 20 per cent., additional freight on the actual freight charged; this extra charge was recoverable every month by the shipper. In the case of the British Cotton Growing Association, they pay the freight and they recover the primage, and what he complained of was delay on the part of the British Cotton Growing Association in recovering it.

Mr. K. P. Pencheon (Montserrat) pointed out that primage is only charged when cotton is shipped continuously by the combined line of steamers. Mr. A. O. Thurston (St. Kitts) said he experienced no difficulty in the matter: he shipped his cotton to his agents and they made the recovery. Similarly, Hon J. S. Hollings (Nevis) shipped cotton to his firm in London.

It was finally agreed that it would be sufficient if the President wrote to the British Cotton Growing Association calling their attention to the matter, and asking them that it might be dealt with more promptly in the future.

Hon. R. L. Warneford (Antigua) then read another resolution with reference to the increasing difficulties in regard to the labour supply. The President ruled that it was rather beyond the scope of the present discussion, and requested that its consideration should be deferred.

Suggested Co-operation between Growers and Fine Spinners.

Hon. R. L. Warneford (Antigua) then put before the Conference another resolution which had been entrusted to him, having regard to the desirability of forming a Cotton Growers' Association in Antigua.

In connexion with this resolution, the President said that, before it was discussed, he would like to put before the Conference a wider suggestion related to some extent to Mr. Warneford's proposal. His suggestion was as to the advisability of an alliance being formed between the cotton growers and the Fine Spinners and Doublers' Association. Premising that the Fine Spinners and Doublers' Association were practically the sole buyers of Sea Island cotton, the President suggested the possibility of something in the nature of co-operation being established between the growers and the buyers—a state in which the growers become the producing side of the business and the spinners the consuming and using side. With that object in view, the President thought that the Fine Spinners might be approached and asked if they would enter into some arrangement with the growers which would be mutually beneficial; they should inform the growers what area to be planted would meet their requirements, and the price to be paid for the cotton would be fixed, or at least bargained over—and this was the essential point—before a single seed is planted. If the spinners refused to give prices which the growers considered reasonable, the growers would refuse to plant any cotton at all and could substitute alternative crops like sugar-cane. The position of the British West Indian islands would be strengthened in the matter of bargaining, by the fact that the production of Sea Island cotton is rapidly declining in the American Sea Islands. Eventually the West Indies might constitute the only source of Fine Sea Island cotton, and

would therefore hold the monopoly. The President went on to point out other advantages that would accrue both to the spinners and the growers as the outcome of an alliance of the nature suggested, and in concluding, called attention to the fact that he was making this proposal entirely on his own authority and not in his official capacity as Commissioner of Agriculture. He invited criticisms or amendments or suggestions in regard to his proposal.

Hon. J. S. Hollings (Nevis) thought that the President's proposition an extremely valuable one in itself, and also as regards the results that were likely to accrue from it. He thought, however, it should not be forgotten that the British Cotton Growing Association consists largely of Fine Spinners and Doublers and, therefore, their views and dealings were likely to be somewhat prejudiced in favour of the users rather than in favour of the growers.

Hon. R. L Warneford (Antigua) thanked the President for the suggestion, and stated that he was prepared to fall into line whether it applied to the present crop or the one which was to follow.

The President hastened to point out that he had made no suggestion as to the machinery to be provided for taking the steps to ascertain whether the Spinners and Doublers are inclined to make such a bargain. What he wished to know was whether the idea put forward appealed to the grower; and, if it did, what steps should be taken to give effect to it. He thought it would be best to defer any further discussion until the next day, in order to allow delegates time to think over the matter.

Prices of Cotton.

The President made a few remarks in connexion with this subject, which are briefly summarized below. After the outbreak of the war there had been a good deal of anxiety as to whether or not the Fine Spinners would be able to carry on their work. With the help of the British Cotton Growing Association the Fine Spinners were induced to agree to take the current season's crop, and 18*d.* per lb. was offered for St. Kitts ordinary cotton, while it was agreed to give all other places 14*d.* per lb. As soon as this was announced, he made efforts to persuade the Fine Spinners to drop geographical distinctions and to base prices upon type. This the Fine Spinners agreed in principle to do, although pointing out that geographical and type arrangements appeared to give practically identical results, each island seeming to have its own particular characteristics. In regard to the forthcoming cotton season, the President said that the Chairman of the British Cotton Growing Association did not advise, this year, another application for a guaranteed price; he was strongly of opinion that planters would do better by not binding themselves to minimum prices.

This concluded the discussion on the commerce of cotton in regard to the present session. The President announced that the next subject which would engage attention was the cultivation and manuring of cotton.

Manurial Experiments with Cotton.

At the request of the President, Mr. F. R Shepherd (St. Kitts) read a paper on the results of manurial experiments with cotton carried on at La Guérite in St. Kitts. This indicated that the results of twelve years' experimentation showed, briefly, that under the conditions existing at La Guérite, with a loose open soil, the application of manures to the cotton plant does not exert the beneficial influence that would de expected.

After this paper had been read, Dr. H. A. Tempany (Leeward Islands) said that the manurial experiments conducted at La Guérite for the past twelve years constitute by far the most complete investigations of the manurial requirements of cotton in the West Indies. He pointed out that the general result of similar experiments conducted in Montserrat, and in earlier years in Antigua, were the same: the effect of withholding manures compared with their liberal application is very small. He thought root range might have something to do with the results obtained at La Guérite.

Mr. S. C. Harland (St. Vincent) then made a few remarks on manurial experiments commenced in that island in the season 1912-13. The plots were $\frac{1}{4}$-acre in size, and eight different series or combinations of manures were applied; the plots were in triplicate—three no-manure, and three for each combination, and in computing the results the average of each three is taken. The experiments showed that when cotton is grown on the same land for, say, three or four years, an advantage is likely to be gained by the use of manure.

Dr. Tempany asked how far black boll disease was likely to effect manurial experiments.

Mr. S. C. Harland said that in St. Vincent, cotton aphis seemed to interfere most with the plots under his control, particularly the no-manure plots. The black boll disease is also a very important interfering factor.

Mr. W. Nowell (Imperial Department of Agriculture) asked Mr. Shepherd and Mr. Harland if they could furnish any information as to the visible effect of manures upon the habit and growth of the plants.

Mr. Shepherd said the no-manure plot this year in his experiments was particularly noticeable for the small size of the plants, but they averaged about forty bolls to the plant. The pen-manure plot gave bushy plants, which grew large and flowered well.

Mr. H. A. Ballou (Imperial Department of Agriculture) called attention to the possibility of there being a parallel between aphis on cotton and thrips on cacao.

The President in summing up, said the general tone of the remarks appeared to be that while manures in a general way do not seem to have produced increased yields where the soil is maintained in good condition, yet it is desirable to apply organic manures for the maintenance of tilth.

(*To be continued.*)

In a short biography of the late John Wood, Director of the Natal Herbarium, the *Kew Bulletin* points out that it was due to him that the Uba cane became established in South Africa. It is stated that the correct name of this cane is unknown, the name 'Uba' represents the only letters decipherable on the damaged label attached to this variety on its arrival in the country. Mr. Medley Wood thought that the plants were introduced by Governor Charles Mitchel on his return from a visit to India in 1884-5. The cane is now very generally cultivated in Natal (see *Natal Agricultural Journal*, Vol. VIII, No. 3, 1905, p. 225). This word Uba may be part of the name 'boubaya' applied to one of the Madagascar canes introduced to the Mauritius Botanic Garden by Dr. J. V. Thomson in 1815. This name may have found its way to India from Mauritius along with the canes sent by Captain Dick in 1827 to the Calcutta Botanic Gardens on behalf of Captain Sleeman. From cuttings of the canes, planted by Sleeman at Jubbulpur, the cultivation of Mauritius canes gradually became established in the Deccan and had reached Bombay in 1838. But if the presence of the word Uba in Natal be due to the survival of the name 'boubaya' in India, that name must now connote a cane unlike the one to which it was originally applied. According to Thomson, 'boubaya' resembled an Otaheite cane.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the importance of science for both the protection and progress of industry.

Interesting notes on the value of birds in the West Indies for the control of pests appear on page 197.

Part of the fourth day's proceedings at the West Indian Cotton Conference is summarized on page 198.

Information relating to pests and diseases in this issue concerns the native food plants of the cotton stainer and thrips, and die-back of cacao in St. Vincent

Moisture and Pressure in Soils.

The latest annual report of the Chief of the Bureau of Soils, of the United States Department of Agriculture, refers to some important fresh ideas which have arisen as a result of American research on the physical properties of soils. It is stated that it has come to be recognized that every physical property of the soil affecting the growth of crops is itself determined by the moisture content of the soil, and that there is a critical moisture content characteristic of each particular soil at which the aggregate of physical properties produces an optimum condition for plant growth. Consequently, the determination of this critical or optimum water content has a practical importance, and a comparatively quick and rapid method for its determination has been developed.

The report then goes on to show how soil pressure is related to moisture It is pointed out that if a soil containing less than the critical moisture content be further wetted, there are pressures developed which are of enormous dimensions on the surface of the individual grains as determined by theoretical calculation, and which are often of considerable magnitude on the surfaces of the soil mass. Pressures of 600 lb. or more to the square inch of soil mass have been observed in the work of the past year. These observations have a considerable interest in theoretical and pratcial studies on tilth. But they have a much more direct importance to engineers and practical constructors having to deal with dams, earth-works, foundations or other like problems, where the earth is liable to continual or intermittent contact with water.

The Source of Nitrogen in Legumes.

Valuable information is contained in Bulletin No. 179, issued by the University of Illinois Agricultural Experiment Station, and dealing with the subject of a biochemical study of nitrogen in certain legumes. For experiment station workers the methods described will be found very useful and valuable, while the general reader concerned with leguminous crops will find the conclusions drawn from these experiments especially interesting. It is shown conclusively that the cowpea and the soy bean utilize atmospheric nitrogen through their roots and not through their leaves. No combined nitrogen could have been assimilated in the gas experiments conducted. The total nitrogen determination shows that about 74 per cent. of the nitrogen of cowpea and soy beans at the time of harvest is in the tops, while the remainder is distributed between the roots and the nodules. In the earlier periods, the roots contain a larger proportion, while later they contain a much smaller proportion. It appears that there is a larger percentage of soluble nitrogen in the tops than in the roots or in the nodules. It is stated further that fixation takes place at a very early period in the growth of the seedling—sometimes within fourteen days. It is rapid in some cases, especially with cowpeas. Plants grown under the conditions of the experiments described in the Bulletin contain no ammonia, nitrites or nitrates as measured by the most accurate chemical methods.

ints for Raising Onions.

The growing of onions has assumed large proportons as an industry in the Leeward Islands. One of e difficulties experienced in some places, especially ontserrat, is the bad germination and development the young seedlings. This appears to be due to fungus disease known as 'damping off'; the organism tacks the young plantlets at the level of the soil, and e aerial portions quickly fall over and die. Recently leaflet has been circulated in Montserrat containing actical hints for raising onions, with a view to avoidg this trouble. Importance is attached to the site and e soil of the plots. The plot should be in close oximity to water, but should be well drained and t in a wet locality. Great importance is attached the method of making the seed bed, and to the nount of seed distributed. Generally speaking, the wer the seeds the better, and they should be well attered over the drill. Good results have been tained by using 1 lb. of seed to 240 running feet of ill formed with an onion hoe, the base of the drill ing at least 2 inches wide, and the seeds well attered; but this is considered to be a maximum nount to use. The seed should not be covered eeply, say, $\frac{1}{4}$-to-$\frac{3}{8}$-inch on most soils.

While the preparation of the plot and the manner planting have an important indirect bearing on the estion of 'damping off', and are probably the best eans of avoiding the trouble, it is still worth remembering that 'damping off' can be lessened by sterilization the soil. This is done by baking the surface il by fire. A section of the onion seed beds in the ontserrat Experiment Station was treated in this way 1915 with apparently good results, and it is worth ying on estates where 'damping off' is prevalent. nother useful measure of control is the provision of ade for the beds. Coco-nut leaves are used for this rpose.

ish Meal as Food for Pigs.

More and more attention is being paid in England the question of economizing the food supply and ilization of by-products. Some conclusive experients conducted by Dr. Crowther at the Institution for esearch in Animal Nutrition, University of Leeds, ave brought out the fact that fish meal is a cheap and seful food for pigs. On the average, an extra 1·35 lb. live-weight was obtained weekly for twelve weeks at trifling cost of barely $\frac{1}{2}d.$ per week. The meal was ed as a partial substitute for 'sharps', a more expensive heat product.

Although the gains obtained were satisfactory, it as thought that perhaps the meal might have imparted objectionable taint to the carcasses of the animals. order to see if this was the case, two pigs one of hich had consumed 1 lb. of fish meal daily for eleven eeks were killed, but no exception could be taken to the eneral appearence, colour, or smell of the carcass, nor d cooking tests or curing indicate any disagreeable aracteristics. Fish meal may therefore be regarded a valuable adjunct in pig feeding.

Agricultural Credit in the West Indies.

It has not yet been placed on record in this Journal that a Co-operative Credit Bank Ordinance (No. 9) was passed during 1914 in British Guiana to provide for the granting of State-aid to co-operative credit banks and for the proper supervision of the same by a central committee. The end aimed at is the promotion of thrift and united action among the agricultural population of the Colony and the furtherance of agricultural prosperity.

The general position therefore in the West Indies, as regards agricultural credit, is as follows. In Jamaica there exists a system of loan banks run on the principles of limited liability but which are partly financed by the Government under a special loans Ordinance; in St. Vincent, St. Lucia and Trinidad legislation for the registration, encouragement and financial assistance of unlimited agricultural credit societies on the Raiffeisen system exists; and lastly, mention may be made of the Barbados Agricultural Bank which successfully furnishes working capital for the use of estates.

Experiment Station Work in Florida.

There has recently been issued the Annual Report of the University of Florida Agricultural Experiment Station, for 1914. It appears from this that of the many lines of work undertaken during the year, plant introduction received considerable attention and was continued throughout the year. The number of different kinds that have been brought to the Experiment Station in the last six years now exceeds 1,324. Special attention has been given to the introduction of field and forage crops. New grasses, new forage crops, and new legumes have been tested in large numbers. Fifty-one kinds of Canavalias (horse bean) have been tried. The Canavalias seemed to give promise of usefulness as a cover crop for a large portion of the State; but as a result of tests conducted, the opinion is expressed that they are not likely to make a profitable forage or vegetable crop in Florida.

Another line of work lay in the direction of experiments which were carried out to ascertain the amount of velvet beans that can be profitably fed to hogs for pork production. The results indicate that the largest increase in weight will be made when the ration is composed of 3 parts of corn to 1 part of cracked velvet beans by weight.

A considerable amount of data also, is said to have been secured as to the effect of different chemicals upon the growth of citrus trees under exactly controlled conditions. These trees were planted in a greenhouse to protect them against the variations due to weather conditions. These experiments also avoided the difficulties encountered in the field from variations in soil, and in a large measure go to complement and supplement the work being done in the citrus experiment grove at Tavares. The data thus collected are said to give important fundamental information, especially as to the effect of different fertilizers in introducing the conditions known as 'frenching' and 'mottled leaf' in the grove.

INSECT NOTES.

NATIVE FOOD PLANTS AND FEEDING HABITS OF THE COTTON STAINER IN ST. VINCENT.

The following notes have been prepared and forwarded to this Office for publication by Mr. W. N. Sands, F.L.S., Agricultural Superintendent, St. Vincent:—

The cotton stainer (*Dysdercus delauneyi*, Leth.) is a serious pest of Sea Island cotton in St. Vincent, and responsible for much loss of crop each season. It has been recently shown by Nowell* that besides damaging lint and seed in the process of feeding, the cotton stainer enables the fungus causing the internal boll disease to enter the boll and destroy its contents, either in part or whole, under certain conditions which are not yet fully worked out. It is the fact, however, that internal boll disease following the attacks of cotton stainers has assumed quite alarming proportions in St. Vincent during the past three seasons of unfavourable weather. Under these circumstances it was considered very desirable, in the interest of the local industry, that the feeding habits of the insect and its native food plants should be studied, in order that additional measures for its control, other than by hand-collecting in the cotton fields might, if possible, be devised.

In St. Vincent all cotton plants have to be pulled up and burnt by April 30 in each year. As the crop is usually over by February, most of the old cotton plants are pulled up by the end of that month. Planting of the new crop is started in May, if the rains have come in by that time.

There was no difficulty, therefore, in respect to cultivated or wild cottons, and it was not on these that the cotton stainer was able to subsist throughout the year.

An account will now be given of the investigations made during the past four months, February to May inclusive, in districts where Sea Island cotton was grown on an extensive scale.

The weather was showery throughout the period and there were no dry spells. In the Leeward and Windward districts where the work was performed, it was with difficulty that the cotton stalks could be burnt, but they were all uprooted by the end of February. The cotton stainers which were present in large numbers in the fields then migrated to trees, bushes and herbaceous plants near-by. In these places it was observed that many of the insects collected together in colonies under the leaves of plants and remained quiescent for several days, whilst others foraged abroad and eked out a precarious existence.

They were seen at this time feeding on :—

Flowers of the Mango (*Mangifera indica*).
" " *Eupatorium odoratum*.
" " Black Sage (*Cordia cylindrostachys*).
" " Horse Radish tree (*Moringa pterygosperma*).
Fruit of Okro (*Hibiscus esculentus*).
" " Maiden's Blush (*Momordica Charantia*).
Secretions of Scale Insects.

They were also observed on certain other wild plants in small numbers, but the larger number were seen on those given above. The food supplied by these flowers, fruit and insects seemed to serve only as a makeshift to sustain life or complete maturity: the insect did not appear to be able to breed upon it, for neither young ones nor mature i[illegible] *in coitu* were observed.

In Trinidad and Tobago, the Wild Okhro (*Malv[illegible] capitata*) and *Sida glomerata* are given as food plants [illegible] another cotton stainer, *D. howardi*, and its variety, su[illegible] but these plants do not commonly occur here.

Attention was then directed to the two malvace[illegible] food plants other than cotton, namely, the Silk Cotto[illegible] (*Eriodendron anfractuosum*, DC.) and the 'John L[illegible] (*Thespesia populnea*, Corr.). The story of the relation [illegible] these to the cotton stainer is of much interest and i[illegible] tance.

THE SILK-COTTON TREE (*Eriodendron anfrac[illegible]*

This large tree was found chiefly in the Leeward distri[illegible] on lands near to the coast, but a few trees occur in th[illegible] Windward district. At the beginning of February this t[illegible] was almost bare of leaves and only on a few trees were leaves t[illegible] be seen. No stainers were present. By the end of February mo[illegible] of the trees were in full flower and still no stainers [illegible] observed, but when the young bolls commenced to swell, the[illegible] the insect appeared, and in a very short time swarms [illegible] mature insects in flight, both male and female, were see[illegible] approaching the trees from all directions and settling on th[illegible] bolls. In many instances the bolls were almost covered [illegible] them. Just before this happened a certain 'liveliness' [illegible] noticed among the stainers on other trees and plants, [illegible] they very quickly left these for the silk-cotton trees.

After feeding for some time on the silk cotton [illegible] the stainers starting mating. Young bugs were first [illegible] at the beginning of April, and before any sound bolls we[illegible] ripe. They were seen both on the ground and on the t[illegible] feeding on cracked or damaged bolls, and later on [illegible] distributed over the ground. They did not appear to b[illegible] able to feed through the thick wall of the unopened fruit [illegible] the same way as the mature insects.

On the ground they were attracted to, or hunted out [illegible] silk-cotton seed over a considerable area. To give an i[illegible] some silk-cotton bolls were cut up in an office quite 50 [illegible] away from a fruiting silk-cotton tree which had been r[illegible] destroyed, and pieces of the bolls were thrown [illegible] a waste paper basket. Within three days a large n[illegible] of young stainers, less than half-grown and unable to fl[illegible] found out the pieces and started feeding on them. I[illegible] was no uncommon sight to see scattered about the gro[illegible] often long distances from trees, bright red balls made up [illegible] young stainers completely covering and feeding on sing[illegible] silk-cotton seeds.

It was towards the end of April that the bolls on th[illegible] trees opened and the seed, surrounded by its floss, was distr[illegible] buted far and wide by the wind. At the end of May th[illegible] were still large numbers of stainers to be seen huntin[illegible] about for the seed, so that already they have been able [illegible] tide over a period of three months by means of the silk-cott[illegible] trees. In two months' time there will be food again for th[illegible] in the cotton fields.

A large number of bolls picked both from attacked an[illegible] [illegible] there was evidence of internal boll disease. As with cult[illegible] vated cotton, there is no external evidence that a boll ha[illegible] been attacked by the insect. Internally there are prolifera[illegible] tions of the carpels disorganized seed, and stained lint. I[illegible] certain cases the state of seed and lint appeared to indica[illegible] the presence of a fungus. [illegible] the Mycologist of the Imperial Department of Agriculture [illegible] a later date, the fungus causing internal boll disease o[illegible] cultivated cotton was not discovered it is possible, however, that the silk-cotton bolls may subsequently be found to b[illegible]

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affected by the disease in wet seasons. Besides the damage described, a severe attack of the stainer may cause the trees to shed their bolls before they attain their full development. In one case nearly all the bolls on a tree were shed. These when examined were found to be completely disorganized internally.

The case against the silk-cotton tree may be summed up as follows: It is a tree which, when it fruits, provides a large amount of food for the cotton stainer, and so enables the insect to feed and breed extensively, and tide over a season when it is so important that its numbers should be reduced to a minimum for the protection of the annual cotton crop, planted in May, June and July; therefore, it should be destroyed or prevented from fruiting.

In some cases it is not desirable to destroy a tree, on account of its age or its usefulness as providing shade. In these circumstances such trees can be pruned back as soon as flowers are seen. There is no danger in taking this course because the cotton stainer only feeds on the bolls. This method has been successfully adopted at the Botanic Gardens, and it is expected that some years will elapse before the trees flower again. It should also be mentioned that the silk-cotton tree does not fruit every year, and it is only a menace to the cotton industry when it does so.

This article will be continued in the next issue of the *Agricultural News* with regard to the John Bull or Gamboge tree (*Thespesia populnea*) as a native food plant of the cotton stainer This tree is an even greater menace to the cotton industry than the silk-cotton tree.

AGRICULTURE IN COLOMBIA.

Mr. M. T. Dawe, who was recently appointed Agricultural Adviser to the Colombian Government, has recorded some impressions of the present condition and possibilities of agriculture in Colombia received during a journey from Santa Marta to Bogotá.

In Santa Marta there are two agricultural zones, a lower and an upper, characterized respectively by the cultivation of the banana and coffee. The export of bananas for the year 1915 had been estimated at 8,000,000 bunches, but it is now calculated that 2,500,000 bunches less will be exported owing to the extensive damage caused by a tornado. Although there is already a bi-weekly service of steamers engaged in carrying bananas to the United States and Europe, there seems to be room for considerable expansion of the trade. The rainfall in the lower zone is so irregular and uncertain that, apart from such xerophytes as Agave, cultivation on a commercial scale is practically impossible without irrigation. This zone should be very suitable for the cultivation of Agave, in which, owing to its favourable geographical situation and facilities for transport, Santa Marta might become a formidable competitor of Tropical East Africa. Although the physical conditions are suitable for the cultivation of cotton, it is improbable that this could be profitably grown on a commercial scale, owing to the high rate of wages.

Para and Guinea grass are used for pastures in the Santa Marta region. Mr. Dawe recommends the introduction of other pasture and fodder plants, and especially of the Velvet bean.

In the upper agricultural zone of Santa Marta coffee is the only plant cultivated on a large scale, the largest plantation being the 'Cincinnati', which has about 350,000 trees. Coffee seems to do best at an altitude of about 4,500 feet, in the Sierra Nevada. The trees are sown at intervals of about 8 feet, and are neither topped nor pruned. The shade tree employed is the guamo (*Inga dulcis*). The average annual yield of dry coffee per tree is said to be 1 lb., and in exceptionally favourable years as much as 1½ lb. The trees seem to suffer from over-shading, and better results might be obtained by the use of species of Albizzia or Erythrina as shade trees, coupled with judicious topping and pruning. A disease affecting both the leaves and fruits of the coffee, on which it appears in the form of round blotches, is probably caused by the fungus *Omphalia flavida*, Cooke. It is most abundant in deep ravines and shady places.

From Santa Marta, Mr. Dawe travelled by rail to Cienaga, and thence by steam-launch to Baranquilla, passing extensive stretches of mangrove swamps. Small quantities of mangrove bark are exported to New York via Puerto Rico, but there is no doubt that many thousand tons could be exported annually, if the Magdalena delta were suitably exploited. The mangrove bark destined for export, seen in Barranquilla, was divided into large pieces, whereas that exported from Madagascar and East Africa is cut into small pieces, 5 inches long and 2 inches broad.

The most noticeable thing in the journey up the River Magdalena, from Barranquilla to Giradot, was the great extent of fertile alluvial land, capable of producing enormous crops of sugar, cacao, rubber and other tropical products; but the country is very sparsely inhabited, and the inhabitants obtain their living by cutting wood for the passing steamers, and grow no more food than is required for their own needs.

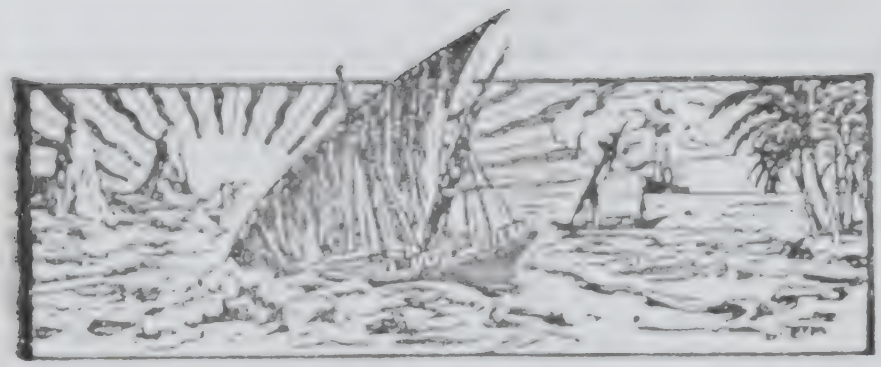
The first step in the development of this region should be the improvement of the navigable channel of the Magdalena. The practice of cutting the trees on the river banks should be prohibited, as this leads to the washing away of the banks.

The condition of agriculture in the Lower Magdalena region might be greatly improved by the establishment of a model plantation conducted on commercial lines, where sugar, cacao, rubber, cotton, maize, rice, kidney beans, etc., could be grown, and the best methods of cultivation demonstrated.

Immense areas of the Lower Magdalena basin are covered with forests which might, under suitable administration become one of the principal sources of revenue in Colombia, judging from the large selection of useful woods seen by Mr. Dawe at Barranquilla. A duty should be imposed on each tree of certain kinds that is felled, and the work of reafforestation should be taken in hand in areas where the forests have been destroyed. This is especially necessary in the Upper Magdalena region, where there is a scarcity of wood for the steamers in certain places.

The estate of Santa Sofia, at Giradot, was examined with a view to its suitability as the site of an agricultural experiment station and college. The means of communication are very good, as Giradot is the junction of the railways to Bogotá and the Pacific Coast, and the upper limit of steam navigation on the Magdalena. The soil of the district is of medium quality and suitable for the cultivation of Agave, but other crops would probably require irrigation.

Evidence of the ravages of locusts was seen throughout the journey, and Mr. Dawe recommends the establishment of a Locust Bureau to control the pest. (*Kew Bulletin of Miscellaneous Information*, No. 10, of 1915.)



GLEANINGS.

It is stated in *Nature* for April 13, 1916, that a series of popular lectures on 'Our Tropical Industries', describing the production of rubber, tea, coffee, cacao, sugar, etc. in the tropical Colonies, and illustrated by collections of the Imperial Institute, will be delivered at that institution on Wednesdays in April, May and June. Admission is free by ticket.

An announcement has been made by the Colonial Secretary of Barbados to the effect that, in view of the shortage of muscovado sugar, as soon as 13,000 tons of this sugar shall have been exported, a proclamation under the Exportation of Foodstuffs Act, 1914, will be issued by the Governor prohibiting all further export of such sugar except under special license.

Reference is made in the Durban *Agricultural News* for February 1916, to the standard maize grades adopted by the Department of Agriculture. It is stated that the standard grades in force are mixed samples of the principal kinds of maize grown in the country, and indicate the quality necessary to obtain the relevant grading certificates for export purposes. They do not cover only one variety of maize; mixture of varieties does not necessarily mean a poor commercial sample.

The editorial in the *Agricultural News* for February 12, 1916, dealt with the measurement of soil tilth, and called attention to the fact that this might be done by using an appliance devised by Mr. C. A. LeClair and figured in the *Journal of Agricultural Research*. Mr. LeClair has written to say that he considers the appliance could be used for this purpose, and is in agreement with the general views put forward in the editorial. This Department is having constructed an appliance of the kind described.

Some suggestions for city persons who desire to farm are given in Circular No. 24 of the Cornell University Agricultural Experiment Station. It is admitted that farming financially is a slow business, but farming investments are, on the other hand, safe. It is pointed out in another section that large crops do not necessarily pay. The beginner nearly always over estimates the importance of large returns per acre. Economy of land is usually much less important than economy of labour and other costs.

In discussing the subject of cattle insurance in India, the *Monthly Bulletin of Economic and Social Intelligence* points out that an insurance society in India has to count on many more factors and risks than a similar society in England. In India, premium rates would have to be so high as to be prohibitive for the average Indian small holder. English experience does not apply in India, first because the normal risks of cattle are much greater than in India, and secondly, because the abnormal risks due to famines and epedemics are practically unknown in England.

Trenching machinery is the subject of *Farmer's Bulletin* No. 698 of the United States Department of Agriculture. This has reference to the construction of drains, and is of great interest; but West Indian areas are too small to afford application of such machinery. The ploughs and scoops described, however, might be found useful. In one of the ditching ploughs described a U-shaped knife does most of the cutting; the side knives just behind the scoop keep the sides of the trench vertical. The Bulletin is profusely illustrated.

In view of the results of various experiments that have been carried out in Trinidad, there seems no doubt that silkworms can be reared successfully in that island. From a report on the subject in the Bulletin of the Department of Agriculture, Trinidad and Tobago, it would seem advisable that attention should be first directed to the mulberry silkworm, and the eri silkworm. It is stated that these varieties have the advantage that their respective food plants grow well in the island, and could readily be planted in any desired quantity. It is suggested that the silkworm industry in Trinidad might make a valuable village industry, which could be carried on chiefly by the coolie women and children.

More might be done in the West Indies in regard to the cultivation of the avocado. It should be possible to raise strains of good keeping quality which could be placed on the American market before the Californian fruit. Two pamphlets by Mr. Wilson Popenoe on the avocado have come to hand. One of these says that the supply of avocados never meets the demand in America. In the second pamphlet, a valuable list is given of the different varieties, of which there are no less than eighty-six, together with the characteristics of the fruits. These pamphlets comprise papers which were read before the Avocado Growers' Association of California. It is worth noting that such an association exists.

The Salisbury Oil Factory is described in the *Rhodesia Agricultural Journal* for February 1916. The nominal capacity of this factory is between 7,000 and 8,000 bags of oil seed per annum. The actual receipt so far has been approximately: ground nuts, 10,000 bags; sunflower seeds, 300 bags; castor beans 100 bags; and 3 bags of linseed. It is evident therefore, that there is need for extension, and that it will be difficult for the factory to handle the coming season's largely increasing production unless the plant is augmented.

WEST INDIAN FISHERIES.

POISONOUS SPECIES.

The British Museum (Natural History) has recently nducted, at the instance of the Governors of Jamaica and e Leeward Islands, an inquiry into the poisonous nature of shes in the West Indies. The report on this work, by Mr. Tate Regan, has just been published in the Barbados *fficial Gazette* (June 1, 1916), from which the following formation has been abstracted.

The first fish referred to is the well-known barracouta, hich name is a generic term for fishes of the genus Sphyraena, which there are three species in West Indian waters. The rgest of these species is a valuable food fish, but it has long een known that individual specimens may be poisonous, ausing severe illness and even death. There is evidently mething more in this than ptomaine poisoning; it seems ore likely that barracouta are poisonous when suffering rom an infectious disease. It is stated that some observers ay, if the fish is poisonous, white fluid runs out of the flesh hen it is cut.

The next fish referred to is Cavallie, a large fish of the ackerel family (Scrombridea) The flesh of fishes of this mily decomposes very rapidly in the tropics and cases of oisoning by this species are probably due to this cause. he name Cavallie is also used to refer to fishes of the genus aranx, some of which may be seriously poisonous at times. he flesh of these fish decompose very rapidly, but it is hought that cases are due to a poisonous secretion formed luring the breeding season by the glands.

The 'Jacks', which belongs to this group are said to ave been referred to by Schombergk as being poisonous in me seasons of the year. When they are suspected of being nwholesome, the reason for the suspicion being small red lumps n their gills, an experiment is tried upon a duck, by giving er one of them to swallow; if at that season it is poisonous, he duck dies in about two hours.

Lastly the Yellow bill Snapper, the Goat fish (of the ed mullet family) and the Grouper of the Sea perch family Salanidae) are all referred to as being poisonous at times, robably during the breeding season.

At the end of the report recommendations are made. n the first place it is recommended that the subject should be cientifically investigated, observations so far being more or ess casual and not altogether reliable. The need for investiga- ion is especially important in view of the fact that many of he suspected species are stated to be sometimes edible and ometimes poisonous. The making and preservation of collection and the proper determination of the species is ne of the first steps to be taken; the habits, food, time and lace of breeding, of each species should be investigated so hat their relation, if any, to the poisonous character of the ish may be established. Should collections be made, the British Natural History Museum would be ready to do the aming.

Pending the completion of such investigations, should hey be undertaken, one can only recommend inspection of he fish offered for sale; that fishes belonging to any species nspected of being poisonous at times should be fresh; that hey should be eviscerated, i.e., gut, roe, etc., thoroughly emoved as soon as possible after capture, and that they hould be especially suspected if they are in full roe, or in ny way abnormal in colouration or condition.

The Cultivation of Sponges.—Some interest has been aroused in certain quarters regarding the possibility of introducing the cultivation of sponges into the West Indian islands. *Tropical Life* for January 1916 refers to an article published by the Imperial Department of Agriculture on the subject as being opportune, the present output of sponges leaving something to be desired, while a further depletion in supply must be looked for. Referring to the same article, *Nature* for April 20, 1916, gives an account of the method of cultivation, and of the high returns to be expected under the favourable conditions pertaining in islands like the Caicos. It is observed that it will be surprising if this industry, apparently so profitable, needs much official encouragement. The subject has also been dealt with in the *Colonial Journal*, and it is understood that the matter has attracted attention in the Bahamas, as well as arousing some personal interest among residents in Barbados and elsewhere. Steps are being taken with a view to making an experimental trial of this cultivation.

INDIAN SUGAR INDUSTRY.

The following are the general conclusions in an article on the Indian Sugar Industry in the *Agricultural Journal of India*, Vol. XI, Part 1:—

It will be seen on a comparison of the figures of the last five years with those of the preceding quinquennium that substantial increase has taken place in the acreage under this crop in Northern India. In Bihar and parts of the United Provinces new factories on up-to-date lines are springing up and making the business pay. The Government Sugar Engineer Expert, Mr. Hulme, is able to guide the owners of prospective factories in the selection and installation of the most efficient kind of machinery. It should not, however, be supposed that results can be obtained in a short time, but now that the problem is being attacked systematically from several aspects, substantial improvement in the Indian sugar industry will result in course of time. It is likely that capitalists will see their way to erecting new factories in Bihar and eastern parts of the United Provinces, as the supply of cane is reasonably assured at a price which, while remunerative to the cultivators, will also enable the factories to work at a profit. As a matter of fact there are factories in Bihar which procure good cane by purchasing in advance from cultivators, and obtain excellent results. The cultivators in the neighbourhood of such factories are saved the trouble of crushing their cane and converting it into *gur*. The strain on their bullocks is thereby lessened, and they are enabled to attend to other agricultural operations. In these days of specialization the cultivator should not undertake the rôle of manufacturer, as he is sure to do it badly. The factory owner should try to have at least some few acres under his own plantation, and then try to increase the outturn by better cultivation, more liberal use of manures, introduction of better varieties, etc. The cultivators, when they see such results, will in course of time adopt the improvements, and this will be to the material benefit of both.

Nowadays competition is so keen and prices are so cut that every possible aspect has to be considered, and in many cases it is only by the fortunate discovery of a by-product that an industry is enabled to carry on. Java has everything in its favour and will certainly not lose the Indian market without a struggle, and it is therefore up to India to face the problem—either to run the industry as a business—to make a profit irrespective of everything else, or to continue as now a state of things which cannot lead to success when put in the field against such powerful and well organized rivals.

PLANT PESTS AND DISEASES.

CACAO THRIPS AND DIE-BACK IN ST. VINCENT.

An article which appeared in the *Agricultural News* for September 25, 1915 (Vol. XIV, p. 314), entitled What Cacao Thrips Signify in Grenada, gave an account of the status of the cacao thrips (*Heliothrips rubrocinctus*) in the cacao cultivations in Grenada. The article was an abstract of a report by the Entomologist to the Imperial Commissioner of Agriculture on a visit to that island in February-March 1915, and embodied the conclusions arrived at by that officer.

In January 1916, the Entomologist and Mycologist visited St. Vincent for the purpose of studying the pests and diseases of cacao, with special reference to the occurrence of cacao thrips, and the conditions which lead to its development in such numbers as to be considered a pest.

The conclusions arrived at as a result of careful study of the situation in Grenada were (1) that the cacao thrips is always present on cacao trees, (2) that it increases in numbers when unfavourable conditions produce an unhealthy state in the cacao plant, (3) that the unfavourable conditions which are known to so affect the cacao as to result in the so-called attack of thrips are (a) insufficient or improper drainage, (b) root disease, (c) poor or unsuitable soil, which may be thin, overlying an impervious subsoil, impoverished by washing or by exposure to sun, (d) exposure to wind, and (e) lack of shade.

It was held by agricultural officers and planters in St. Vincent that the conclusions arrived at as a result of a study of Grenada conditions would not apply to St. Vincent, where the cacao thrips continued to give trouble as a pest of importance.

In a report to the Imperial Commissioner of Agriculture, signed jointly by the Entomologist and Mycologist, on the observations made in St. Vincent, it is shown that while the circumstances of the cacao cultivations in St. Vincent differ considerably from those in Grenada, the same general statements apply to the conditions which result in the outbreaks of thrips in the two islands.

The following is copied from the joint report of the Entomologist and Mycologist already referred to. The five estates visited are referred to by letter instead of by name.

General Conditions of Cacao in St. Vincent.

Although consideration of the rainfall and topography in St. Vincent might incline one to the opinion that the conditions would be very suitable for the cultivation of cacao, it is significant that cotton rather than cacao is the crop which has made important progress in recent years.

The available figures show that as much as twenty-three years ago (1893) the cacao industry was well established and the development since that time has not been very great. Cacao has never assumed a place of great importance in the agriculture of the island: the output in normal years has remained practically stationary since 1897.

Cotton, on the other hand, which requires for its successful cultivation climatic conditions which in many respects are the opposite of those most suitable for cacao, has, since its introduction in 1903 become a much more valuable crop than cacao, and has approached the position held by arrowroot, which is the principal crop of the island.

If the conditions existing in Grenada, which is eminently a cacao-producing colony and not at all a cotton locality are contrasted with those of St. Vincent, it is readily seen that in matters of climate and topography, the two islands are very similar. The one outstanding point of difference is to be found in the character of the soil.

The Grenada soil is moderately heavy, retentive moisture, and is underlaid at varying depths by a relative impervious subsoil.

The St. Vincent soil is remarkably light, offering ve little resistance to the passage of water.

We are of opinion, and in this we are in accord with t Agricultural Superintendent, that as a consequence of th condition of soil, the atmospheric humidity is much bel what would be expected from a consideration of the rainf statistics of the island. In other words, in spite of an abu dant rainfall, St. Vincent presents the conditions of a relative dry island.

We hold that these conditions explain the position wi respect to cacao and cotton above referred to, and that it indicated that in St. Vincent cacao is being grown near the margin of permissible dryness.

In this we refer more especially to the absence of th degree of atmospheric humidity which is recognized essential for the successful development of a cacao cultivatio but in addition to this the soil conditions are such that t roots are liable to suffer from a relatively short period of d weather. Under these circumstances, the cultivation ca for very careful attention to such measures as tend conserve the atmospheric humidity and the soil moistur

This indicates the necessity of providing a fairly den top shade, of covering the soil in all open places by quic growing plants, and the use of wind-belts and margin screens to prevent as far as possible air currents in cac cultivations, and also the free and regular use of organ manures and mulches in order to make the soil mo retentive.

These light soils not only lose their moisture rapidl but they possess little ability to retain plant food for ar length of time, and it is necessary to maintain the so fertility by systematic manurial treatment, by using suc materials as those indicated above.

Conditions at Estate A.

At estate A, thrips, though present in all parts of th cacao cultivation and perhaps on every tree, were at th time of our visit nowhere particularly abundant. We ar told that this insect has two periods of abundance on thi estate: one in September and October, in the midst of the we season, and the other in April and May, in the dry season During the past two years they have been very abundan during these periods.

The Entomologist visited this cacao in October 191 The trees then were in good condition, having greatl improved after a severe attack of thrips which had occurr a few months previously. In the report on this visit, pub lished in the Annual Report of the Botanic Station, 1912-13 it was stated that this improved condition was believed to b due, in part at least, to manuring, forking, and genera agricultural conditions. This improvement appears to hav continued through 1913 and 1914, the severe attacks o thrips which led to the present conditions having beg towards the end of 1914 or early in 1915.

The conditions which we found that were asso with, or were supposed to be the results of, extremely se thrips attack, were (1) several patches in which trees h died where root disease due to two species of Rosellina w found by the Mycologist; (2) groups of trees and individu trees which were dead or dying without any manifestation o disease: their failure took the form of a progressive die back. The trees so affected had been subject to repeated se attacks of thrips, and the dead branches were infested wi the die-back fungus, Diplodia.

The death of trees where root disease was plainly present easily accounted for, and the attacks of thrips on such s while they are failing is easily understood. The other dition, that in which the die-back occurs, is more obscure. These die-back trees range in size and age from small ly planted supplies to large, fairly old, established trees. are informed that the older trees suffer repeated attacks of ps, each attack causing a fall of leaf, and each succeeding h of leaf being smaller than the former, both in the number eaves and in their size. After two or three such attacks, tips die and are pruned back to live wood, this being eated after each later attack until nothing remains but main stem and short stubs of the principal branches. ally these remaining portions succumb, the roots apparently ng last of all.

It is quite natural perhaps for the planter to argue that loss of vitality which results in the gradual death of the is due to the repeated attacks of thrips and the consent loss of foliage, especially as the bark and wood of the er portions of branches, stem, and roots remain healthy il the last.

The outstanding features of this condition are these: the young trees do not grow, (b) the established trees ch suffer are near to trees in good health and often te contiguous to such trees. Taking these points er consideration: (a) young cacao trees in good health uld make quick recovery after planting out, and develop least one flush of new leaves before being attacked, their roots are all right, and they are planted in good ; (b) the trees suffering from die-back are in some , or from some cause, more susceptible to thrips and plodia than their neighbours. It is inconceivable that oining trees in equally good health should be attacked uch different degrees of intensity by these pests, for thrips always present even on healthy trees. Trees which were nted out to us as being free from thrips were found harbour these insects in some numbers, but on account he vigour of the tree the insects had not increased in nbers, and had not perceptibly affected its condition. s is the normal condition of a healthy cacao tree. Thrips always present but the tree does not suffer, and no visible ct from their feeding is produced. When, however, the ditions are such that the tree becomes unhealthy or weak, ips seem at once to begin to make abnormal increase in nbers, and the first dying back of tips is accompanied by appearance of Diplodia.

(To be continued.)

ONCERNING COTTON SEED AND ITS PRODUCTS.

The Report of the Chief of the Office of Markets and al Organization, for the fiscal year ended June 30, 1915, ntly issued by the United States Department of Agriure, contains amongst other important matters, information cerning the marketing of cotton seed and its products, sture determination and analysis of cotton seed, advanes to be derived from co-operative oil mills, uses of cotton- products, and kindred matters. This shows what is being e to make the best of the industry in the United States, shou'd be of interest to those concerned with the cotton ustry in the West Indies, as emphasizing the advantages be secured by co-operative action in any attempts to her develop the industry in these islands.

In regard to the marketing of cotton seed, studies and estigations under this product, it is premised, are conducted narily to determine the factors which influence or control prices paid for cotton seed and its products, the advantages to be secured by producers through marketing cotton seed co-operatively or through co-operative cotton mills, and the uses to which the cotton crop and its products are devoted. The work was begun in October 1914, and the result, so far, may thus briefly be summarized. The geographical location of all cotton-seed oil mills in the United States has been determined; existing rules relating to the grading, buying and selling of cotton seed and its products have been compiled, compared, and studied with a view to working out a uniform set of rules for grades and grading Copies of State laws regarding the taxing, branding, guaranteeing, sampling and inspection of cotton-seed products as foodstuffs, as well as recent State legislation relating to the cotton-seed industry have been collected.

Through the co-operation of the chemists of several cotton-seed oil mills, moisture determinations were secured on 3,623 carloads of cotton seed marketed from the crop year of 1914, and over 12,000 complete analyses of cotton seed grown during that season from points of all parts of the cotton belt have been collected. These analyses show the percentage of meats, lint, oil, ammonia, and moisture content in the seed. It is pointed out for the benefit of those interested in buying and selling cotton seed, that the moisture content may be determined quickly, accurately and cheaply at the cotton-seed oil mill, and that cotton seed should be graded and stored on the moisture-content basis, as this principally determines its keeping qualities.

From investigations of the organization and operation of co-operative oil mills, as also of a co-operative compress company, and of a co-operative marketing association connected with a co-operative oil mill, it has been found that certain co-operative cotton-seed oil mills properly organized and conducted, have netted the farmers about 25 per cent. more for their seed than they could have obtained in the open market. This is a point which should appeal strongly to cotton growers in the West Indies, especially in view of its bearing to discussions at the Cotton Conference held recently in St. Kitts.

One hundred and twenty-four uses have been found for cotton-seed products and by-products, and a chart has been drafted showing their derivation. Besides the well-known culinary purposes, the by-products of cotton-seed oil are used extensively for soap and washing powders, and to some extent for making such commodities as putty, candles, insulating material, paint, composition roofing, linoleum and artificial leather. It has been found, too, that the process of manufacturing vegetable lard from hydrogenated cotton-seed oil has been greatly improved and its market extended. Linters and cotton-seed hull fibre are now being used to a great extent in the preparation of cellulose, from which pyroxylin is manufactured. Pyroxylin is used in the manufacture of celluloid, cellodion, varnishes, artificial silk, moving picture films, etc. Collulose is also made into guncotton or nitrocellulose, and in the high explosives.

A note in the *Rhodesia Agricultural Journal* for February 1916, states that great strides have been made in Rhodesia in the distribution of Napier's fodder, and it seems likely that they will soon be but few farms in Southern Rhodesia on which a considerable patch of this grass is not found. There is a general concensus of opinion that in this plant one has a fodder of great value, comparable in feeding value to maize stalk roughage. Compared with sugar-cane fodder it proves to be twice as rich in protein and equally rich in carbohydrates. Napier's fodder is also known as Elephant grass, of which the scientific name is *Pennisetum purpureum*.

MARKET REPORTS.

London.—The West India Committee Circular, May 4, 1916.

Arrowroot—2½*d.* to 4½*d.*
Balata—Sheet, 3*s.* 2*d.*, block 2*s.* 2*d.*
Beeswax—No quotations.
Cacao—Trinidad, no quotations; Grenada, 79*s.*; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£34 10*s.* to £35.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—40*s.* to 45*s.*
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £8 10*s.*
Mace—7*d.* to 2*s.* 3*d.*
Nutmegs—9*d.* to 1*s.* 2*d.*
Pimento—3¾*d.*
Rubber—Para, fine hard, 2/10½; fine soft, 2/8½; Castilloa no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 18, 1916.

Cacao—Venezuelan, $16·40 to $16·50; Trinidad, $15·40 to $15·75.
Coco-nut Oil—$1·10 per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c.
Copra—$6·50 per 100 lb.
Dhal—No quotations.
Onions—$5·00 to $5·50 per 100 lb.
Peas, Split—$9·00 to $9·25 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·25 to $7·50; White., $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 17, 1916; T. S. Garraway & Co., May 16, 1916

Arrowroot—$5·00 per 100 lb.
Cacao—$16·00 to $17·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda $85·00: Cacao manure, no quotations; Sulphate of ammonia, $100·00 to $105·00 per ton.
Molasses—No quotations.
Onions—$2·75 to $4·00.
Peas, Split—$10·00 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $3·00 to $3·75 per 160 lb.
Rice—Ballam, $7·30 to 7·60 per 190 lb.; Patna, no quotations: Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·50.

British Guiana.—Messrs. Wieting & Richter, April 29, 1916; Messrs. Sandbach, Parker & Co. May 5, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	63c.
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$24 per M.
Coffee—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	8c. to 8½c.	9½c. to 10c. per lb.
Dhal—	$6·75 to $7·00	$6·50 to $7·75
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 11c.	12c. to 14c.
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$5·00
Lisbon	——	——
Potatoes, Sweet, Barbados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$6·25 to $6·00
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$4·60 to $4·70	$4·60 to $4·70
Yellow	$5·10 to $5·20	$5·10 to $5·20
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 36c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$5·00 to $7·00 per M.
,, Cordwood	$1·80 to $2·00 per ton.	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

BOTANY, GOVERNMENT ... SEP 6 19...

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The Shortage of Pigs.

IN common with the price of other food products, that of pork and bacon is at the present time at a high level, and has been for the last two years. In the English market Canadian and American hams and bacon are over 10s. per cwt. more expensive than they were three years ago, and there is a tendency for the market to rise still higher. Locally, in Barbados, fresh pork, that is, pork from pigs grown and slaughtered in the island, is a penny a pound more expensive; lard shows a still greater increase; while imported hams and bacon of very questionable quality are exceptionally dear. This condition holds good more or less throughout the West Indies, and in fact it may be said that at the present time there is a general shortage of pig products all over the world.

In the current issue of the *West Indian Bulletin* there appears an article which describes a co-operative bacon factory working in Bedford, in England; this article has been published in continuation of a previous one of a more general character that urged the more extensive production of pigs in the West Indian islands on co-operative lines, utilizing the by-products of the crops at present grown, the pigs being ultimately converted into bacon and hams in a factory somewhat similar to that referred to above. Owing to the unsettled state of affairs that has existed, efforts to invoke the attention of capitalists have not, so far, proved successful. It would seem, in spite of the shortage of pigs and consequent high prices, that it is not possible to attempt to meet the demand at present on a large scale. The only thing that remains, therefore, is to urge that a start should be made at the other end: that the individual planter and peasant should raise as many pigs as possible and send them either to the local market to be sold as pork, or else make an attempt on a small domestic scale to manufacture pork, hams and bacon.

Pig raising in the West Indies may take two forms. It may be conducted as it usually is, on a small scale, two or three animals being kept in sties more or less for domestic purposes; or it may be conducted on a larger scale, where a herd of swine is maintained. Carried out on this larger scale, pig

raising would necessitate grazing land, and the production of special crops for feeding purposes. This system is quite common in the Southern States where sweet potatoes—the best field crop for pigs—ground nuts and cowpeas, and even grass are grown especially for the maintenance of these animals. There is no doubt that with present prices the production of pigs on this scale would pay. As regards the provision of more concentrated feeding stuffs, it should be remembered that on sugar estates there is generally an abundant supply of molasses, and large quantities of filter-press cake —valuable for pig feeding on account of the calcium phosphate it contains—that can be obtained at very small cost. On lime-growing estates there is refuse in the form of skins and seeds; on arrowroot estates, the refuse of the works; while on coco-nut estates, as a contemporary puts it, 'there is plenty of room for the pigs to roam about in, and an unlimited supply of oil-cake to feed them on.'

The pig is the most efficient meat-producing machine there is. At the same time, under tropical conditions, some kinds of pigs do better than others. Further, the kind of pig to breed depends upon what product it is one's intention to produce, and also with what food and under what conditions it is to be fed. A Jamaica contemporary says that for some conditions, the old-fashioned small black pig called China—distinct from the Poland-China—is the best. It is essentially a grazing pig able to utilize grass and weeds; it matures quickly but never grows to a large size. It is distinctly a lard pig, having a large proportion of fat to lean. It is no good for curing as ham or bacon. An opposite type is the Large Black, which is essentially a pork pig and requires rich food. The Berkshire or the Poland-China—the latter an American breed—are perhaps the best general breeds for the West Indies. Above all, these breeds are the best for the production of hams.

On several occasions information has been published in this Journal as to the method of curing hams and bacon.* It is an industry which might be developed even on a small scale by individuals in several of the West Indian islands. Recently a trial was made by the Government Veterinary officer in St. Vincent with regard to the salting of pork. A pig weighing 118 lb. was killed and salted. This animal, a locally bred barrow of the razor-back type, gave 87½ lb. of pork. The mixture used for salting was 8 lb. of common salt, 3 lb. of white sugar, and 2 oz. saltpetre. The finished product sold readily. Apparently the only difference between this and the imported article was the thickness of the fat and the difference in the colour. The fat was not as plentiful, and the lean was redder than in the case of the imported pork. This experiment has been referred to in some detail in the hope that it may encourage similar enterprise elsewhere. Attempts at ham production are especially to be encouraged, and it is hoped that those who can, will experiment in this direction and make known their results.

*See *Agricultural News*, Vol. XV, pp. 36, 61, and 159.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the C.R.M.S. 'Caraquet' on June 29, for the purpose of paying an official visit to St. Lucia. Dr. Watts is expected to return by the C.R.M.S. 'Chignecto', on or about July 12.

HURRICANE WARNINGS.

The approach of the hurricane season makes it desirable to publish the following information concerning the nature, and the signs which indicate the approach of these storms in the West Indies.

It is urged that instruction in connexion with this subject should be given in all secondary schools in the Windward and Leeward Islands, and possibly in the primary schools as well. One or two lessons given in each year immediately before the hurricane season should prove of real service.

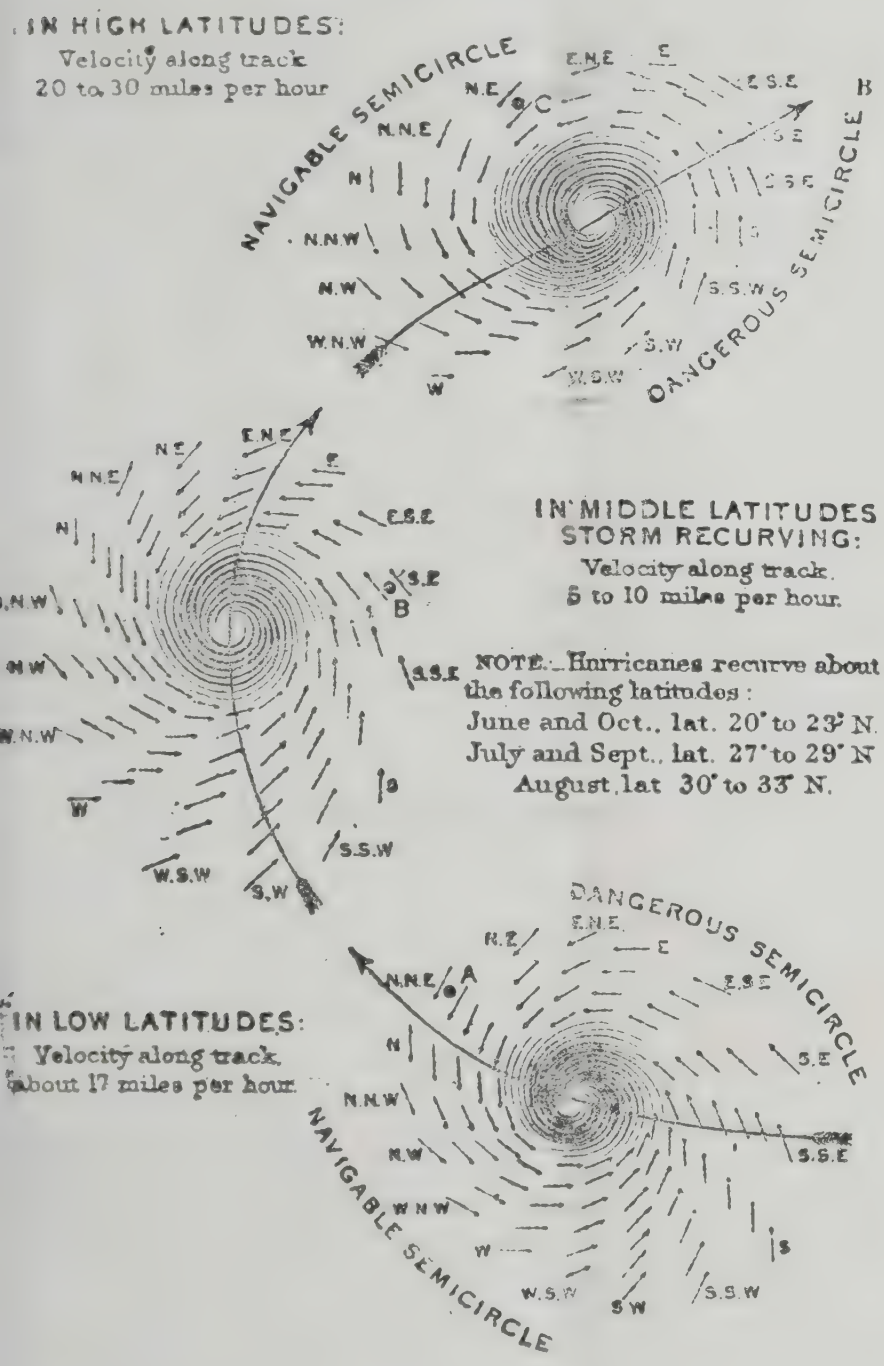
It is first desirable to point out the nature of a hurricane and its path of transition. With this object the diagrams below have been reproduced, having previously appeared in this Journal in connexion with an editorial on hurricanes (see *Agricultural News*, Vol. VIII, p. 209).

The lowest figure represents the storm during its passage through the West Indian islands, before it takes a sweep round to the north or west of Cuba, into the North Atlantic (top figure).

The motion of rotation and the motion of translation may be well understood by spinning a top and giving it a counter-clock rotation. It will be seen that while the rotation may be very rapid round the centre, the top itself may remain in one spot. This rotation corresponds with the violent wind of the hurricane. By noting the direction in which any part of the edge of the spinning top is moving in relation to the centre, it will be obvious that the position of the centre is at right angles to this line of movement. Consequently in a hurricane, if the observer stands facing the wind, the centre of the storm is on his right hand. He can trace the movement of the centre by noting the change in the direction from which the wind blows

The reader will find it instructive to take a number of points on the lowest section of the diagram, which corresponds with West Indian conditions and note (a) the direction of this wind (the arrows fly with the wind), and (b) the relative position of the centre.

Reverting to the spinning top, while it may remain spinning on one spot, it may, on the other hand, move from this; there will then be two motions: a spin and a progressive



motion; this latter is represented in the hurricane by the movement of the revolving storm from one place to another. Usually West Indian hurricanes approach the islands from the Atlantic, that is, from East or ESE, and travel towards Cuba and the American coast where the path curves northward and finally eastward, so that the storms pass out into the North Atlantic.

This progressive motion across the West Indian islands is comparatively slow, ranging from about 7 to 14 miles an hour.

An observer, therefore, knowing the general trend of the hurricane's path may, by observing the direction of the wind and its changes, form a very good idea of his position as regards the centre, and whether the centre is coming directly towards him, or is passing on the north or on the south side of him.

If the direction of this wind remains fairly constant in a direction NNE or N, or NNW, the probability is that the centre is directly approaching. Conversely, when the wind direction remains SE, ESE and S, the centre is moving directly away.

Where the motion of the wind changes from NE to ENE, E and ESE, the centre is passing on the south side of the observer.

When the direction changes from NW to WNW, S and WSW, the centre is passing to the north of the observer.

These rules apply in the West Indies only: they should be checked by making trial observations on the lowest figure in the diagram until the matter is clearly understood. From these an observer can anticipate fairly exactly what may be expected to happen, and—a matter of great importance—he is able to recognize when the centre has passed and the storm may be expected to begin to abate.

The violence of the wind increases as one approaches the centre: at the centre itself there is an area of calm. When this centre passes over any particular place the direction of the wind suddenly changes, and the wind after its passing begins to blow violently from exactly the opposite direction from that from which it blew before: this is a feature of considerable importance in West Indian hurricanes. The barometer falls rapidly as one gets nearer and nearer the centre, so that the barometer affords a means of marking the approach of the centre and the probable distance that it is away, while the changes in the direction of the wind afford clear indications of the line along which the centre is travelling.

In judging the direction of the wind it is best to note the direction in which the lower clouds are moving: this is better than observing weathercocks or flags.

It is worth noting that in the West Indies—the rule does not apply elsewhere—in describing the direction of the wind, when one employs the term south, the centre has passed and conditions may be expected to improve. This may be confirmed by noting the position of the centre in relation to such winds as SSW or SE, or any in which the term south occurs.

On the other hand, the dangerous position is indicated by those winds which involve the use of the term north, as may be seen by noting what is implied by such winds as NNE, or N or NE.

The first indication of an approaching storm is frequently a heavy swell, breaking in heavy surf along the shore: these waves come from the direction of the centre of the approaching storm. They may be noticed many hours, sometimes a day or two, before the storm passes.

The next indication is usually some disturbance and unusual movement amongst the higher clouds, coupled with unusual light, often a coppery glare, at sunrise or sunset, particularly the latter: the wind is then unusually irregular and pufty, and the atmosphere moist and oppressive. The next indication is a fall in the barometer, and then the observer may feel certain that a cyclone is in existence.

It is worth noting that cyclones may, and do, exist in which the wind is rotating with only moderate velocity: they present all the characters here referred to, save that not having violent winds they do no damage: it is only when the wind blows violently that a cyclone becomes a hurricane.

These facts are readily grasped and appreciated; a knowledge of them is of great service to West Indians, enabling them to take such precautions as are possible to protect themselves and their property from approaching storms, and relieving their minds of great anxiety when they are able to recognize that a threatened storm has passed.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. According to a report forwarded to this Office by Mr. J. C. Moore, Superintendent of Agriculture, the work in the Experiment Stations in this island during the months of April and May, comprised the harvesting of nut-eddoes, horse beans, Lima and red beans; spraying limes for scale insects, preparing land for planting in June, selecting Marie Galante cotton seed for planting and distribution in Carriacou. In regard to staple crops, cacao trees have put on new growth and are flowering, and the crop is reported as good; shipments of cacao to May 31 were 68,053 bags as compared with 55,825 bags at same period last year. Limes are good, on the whole; there is a promising set of young fruit. Respecting sugar, reaping operations are still in progress, and the crop and prices are reported good. There is, however, room for much improvement in cultivation. The Superintendent visited six estates on agricultural inspection and instruction work; also Carriacou to arrange for starting a demonstration plot of cotton (Marie Galante) in connexion with a scheme for improving the cultivation of cotton in Carriacou. The appointment of Mr. W. O'Brien Donovan on probation, as an Agricultural Instructor from June 1, on which date he is supposed to have assumed his duties, is recorded.

ST. VINCENT. Mr. W. N. Sands's notes for May state that in the Experiment Stations, work included the planting of a plot of cane B. 147 in the new cane nursery, and the preparation of land for other varieties; experiments carried out on the control of the mole-cricket; manurial experiments with arrowroot, similar to cotton, laid out in four series and manure applied; plots of hybrid cottons sown, while 500 imported coco-nuts from St. Lucia were inspected, and 3,000 cane cuttings from Antigua fumigated. Plant distribution included 202 lb. selected Indian corn, 800 potato cuttings, and 6 coco nut plants. Further progress was made with the destruction of the Silk-cotton and 'John Bull' trees, but much work, says, Mr. Sands, is still to be done, if the cotton stainer is to be kept down. The Agricultural Superintendent addressed meetings of small growers at seven centres. At these meetings the present position of the markets for the products grown in each district was described, as well as the outlook for the next few months. A leaflet entitled, How to Grow Indian Corn or Maize in St. Vincent, was distributed at each meeting.

The weather was showery, but drier than usual for the month. The rainfall recorded at the Botanic Station was 9·93 inches, and 6·54 inches at the Experiment Station.

The cotton Inspector rendered considerable assistance in arranging meetings for the Agricultural Superintendent, and devoted time to the dissemination of information in different districts in regard to the recent work on cotton stainer eradication, and the desirability for the destruction of 'silk cotton' and 'John Bull' trees.

DOMINICA. Mr. Joseph Jones' (Curator) writes to the effect that work in the Experiment Stations during the month of May consisted in picking and recording the crop, weeding and forking in the lime experiment station, and mulching, applying manures, picking and recording the crop in the cacao experiment station. From this station 20 bags of cacao were shipped to London. In the Botanic Gardens operations partook of the nature of general routine work in keeping the gardens in order. Touching the condition of the staple crops, lime trees in the Roseau district are reported to be suffering from want of rain, but in most of the out-districts light showers have been general. Three heavy shipments of green limes were made during the month. The local price for unpacked green limes fell to 12*s.* per barrel. A plot of land of about 1½ acres was enclosed with a fence and planted up in selected coco-nuts. This constitutes an interesting item of special work by this officer. The weather is reported dry, the rainfall for the month being 2·05 inches.

MONTSERRAT. Mr. Robson reports that two distillations of bay leaves were made, some 8,000 lime plants were transplanted for distribution later, and a fair amount of seed of the Ajowan plant was collected. This represents the chief work in the Botanic Gardens during the month. Regarding staple crops, the greater portion of the windward cotton crop was planted in March and early April, while the larger proportion to leeward was not planted till May. The crop generally has received a fair start. The area grown in 1915-16 was 1,953 acres, and the average yield of lint per acre is estimated at 142 lb., a few bales remaining yet to be shipped. Some of that shipped has sold at 1*s.* 6*d.* per lb., and valuations prove, on the whole, to be satisfactory. A very considerable increase is anticipated in the amount of sugar shipped, and a healthy interest is being shown in the cane crop generally. The extension of lime cultivation at Roches, Blakes, and Whites is also a good sign, and Mr. Robson entertains no doubt that another good season would revive considerably the planting of limes. A large area has been planted in ground nuts. An interesting line of development is, that one estate proposes raising its own bay trees for planting; the seed for the purpose will be supplied from the Chateau experiment plot, at present carrying a large crop of seed.

ANTIGUA. During the month of May, Mr. T. Jackson states, the following plants were distributed: cane 655, sisal 175, coco-nuts 49, mahogany 54, Eucalyptus 127, whitewood 4, papaws 50 and miscellaneous decorative 85. Work in the Botanic Gardens included the raising and potting of a number of new sweet potato varieties; new cane varieties were transplanted into nurseries, and a considerable amount of work was done in raising Eucalyptus, Prosopis, etc. About half of the cane crop in the island has been reaped. Gunthorpes Factory has made to date 6,000 tons of sugar, and Bendals 1,338 tons. Difficulty is being experienced in shipping molasses owing to limited facilities. The cotton crop for the past season, it is anticipated, will approximate 56,000 lb. lint. A committee meeting to consider the formation of a lime growers' association was held during the month. Included in work contemplated, are the reaping of manurial and variety sugar-cane experiments, the cultivation of Skerretts sugar-cane nursery, and the planting of various economic experiments.

ST. KITTS. The Agricultural Superintendent (Mr. F. R. Shepherd) says that in the Experiment Stations selected cotton seed was planted in progeny rows, and cotton manurial plots were planted. Operations included also the reaping of the sugar-cane varieties at Estridges, and the manurial experiments at Buckleys and Brighton estates. With the bright weather of the past month the reaping of the cane crop has rapidly progressed. The Central Factory has made well over 8,000 tons of sugar, and expects to complete operations in about six weeks' time. The muscovado planters have not yet been able to ship their sugar in any quantity owing to the want of shipping facilities. St. Kitts being the last port of call for the steamers, they arrive here with little space to spare. The young cane crop is well advanced and presents a very healthy appearance. With the present weather the prospects for next season are very hopeful. The young cotton planted in the northern district in March, is well advanced and bolling. The absence of 'rogues' is very conspicuous.

In consequence of the departure of the Chemical Assistant to take up his appointment in Sierra Leone, there is no report of work done in the Laboratory for the month.

NEVIS. Mr. W. I. Howell writes to the effect that the reaping of the cane crop is still in progress; there is a fair amount of sugar on the island to be shipped, but the steamers do not take any freight. The young canes are looking well, except in certain places where they are suffering much from want of rain There are over 400 acres already planted in cotton, and preparation is still in progress An Act has been passed compelling the destruction of old cotton. The rainfall for the month was 3·82 inches; for the year to date 5·28 inches.

STUDIES ON FRUIT JUICES.

The following extracts dealing with the preparation of fruit juices furnish information of interest in connexion with the preparation of lime juice cordial, and the utilization of oranges and other fruits grown in localities where transportation of fruit in bulk presents difficulties. The information is taken from the *Experiment Station Record*, Vol. XXXIII, No. 4:—

It was found that ordinary methods of sterilizing fruit juices by heat could be applied successfully to only a limited number of the special fruits as black raspberry, blackberry, black currant, sour cherry, and peach. The strawberry, red raspberry, red currant, pine-apple, and citrus fruit juices, and apple cider were found to lose in flavour when sterilized by heat. Special tests were made with the latter named fruits for the purpose of devising methods of storing by refrigeration or sterilization with carbon dioxid.

Satisfactory yields of juice were easily obtained from all of the fruits studied. Lemon and orange juices were best expressed by cutting each fruit into several pieces and then pressing, a method which could be successfully used in pressing pine-apples, although the method of pressing the fruit without previous cutting is probably superior. It was found advisable to pass all of the other kinds of fruit pressed without heating through an apple grater to facilitate the outflow of the juice.

Heating before pressing in the case of black raspberry, blackberry, red currant, black currant, and huckleberry juices resulted in larger yields of juice, and the development of more colour and a more distinctive flavour than were obtained from cold pressing. Strawberriers, red raspberries, cherries, peaches, pine-apples, lemons, and oranges were cold pressed.

Heating the juices sufficiently to sterilize them did not affect injuriously the colour of any of the fruit juices, though pine-apple, lemon, and orange juices usually darkened somewhat if heated in the presence of dissolved oxygen, or if exposed to atmospheric oxygen during the heat treatment.

The distinctive flavour of the fresh fruit was greatly injured, and the familiar cooked-strawberry taste appeared when strawberry juice was sterilized by heat. The fresh fruit flavour of orange juice was also distinctly injured when the juice was heated. Although all lost in the quality of freshness, heating did not seriously affect the flavour of other fruit juices, except in cases where the heat employed was excessive.

The extent to which colour and flavour were retained on keeping the juice after sterilization varied greatly in the juices from the various fruits. In strawberry juice the brilliant red colour of the freshly sterilized juices in all cases faded greatly, and further flavour losses occurred. Sterilization and subsequent keeping in carbon dioxid were not effective in securing colour retention.

When sterilized and subsequently kept in carbon dioxid the distinctive colour of pine-apple juice remained practically unchanged. When exposed to atmospheric oxygen at juice surfaces during and after sterilization marked darkening occurred. Change in colour was also found to be greatly, though not wholly, retarded by keeping the juice in cold storage at from 32° to 35°. On keeping the juice at ordinary temperatures the distinctive pine-apple flavour gradually lessened, though the juices remained recognizable as pine-apple. By keeping in cold storage at from 32° to 35° F. flavour change was almost wholly prevented.

Lemon juice darkened in colour if sterilized and kept in the presence of atmospheric oxygen, though the colour was satisfactorily retained when the juice was sterilized and kept in carbon dioxid or in vacuum. In all cases an off-flavour, designated as a 'bottled lime-juice' flavour, appeared in the lemon juice after it had been kept for a time after sterilization, even though in cold storage at from 32° to 35°.

Orange juice also underwent a marked darkening in colour when kept at room temperature after being sterilized. The colour was fairly well retained when atmospheric oxygen was excluded by sterilizing the juice and subsequently keeping tight in vacuum or in carbon dioxid, and the change in colour was well controlled by keeping the juice at low temperatures. The flavour of sterilized orange juice, already slightly injured by the heating necessary for sterilization, underwent further changes when kept at room temperatures. It was found that by keeping the juice in cold storage at from 32° to 35°, the flavour was well retained for long periods.

The distinctive colours and flavours of all fruit juices kept in freezing storage at about – 10° C. (14° F.) were found to remain practically unchanged during many months, except that a peculiar coagulation of much of the colouring matter appeared in the juice of the black raspberry. It was possible to concentrate fruit juices to syrups by freezing out the water as ice and centrifugalizing. Characteristic colours and flavours were well retained on concentrating.

Infusorial earth greatly promotes the filtering of fruit juices, as it retards greatly the clogging of the filter.

Export of Pigeon Peas from St. Vincent.—

Mr. W. N. Sands, Agricultural Superintendent, has furnished this Office with the following table giving the destination, quantity and value of the exports of pigeon peas from that Colony from December 1, 1915, to May 31, 1916:—

Destination.	Barrels of 224 lb. net.	Value at $9 per barrel.
Barbados	519	$4,671·00
St. Lucia	40	360
Grenada	33	297
Demerara	4	36
Martinique	3	27
Trinidad	2	18
Total	601	$5,409

The peas were valued in St. Vincent at $9 per barrel, but sale prices ranged from $9 to $12.

It is of interest to note that of the 601 barrels, Barbados took no less than 519.

The industry represented by the above figures is more or less an undeveloped one and should be capable of being expanded in islands like Montserrat, Nevis, Anguilla, Barbuda and the Virgin Islands. It should also be possible to do more in regard to the export trade from St. Vincent to Demerara and Trinidad.

COTTON CONFERENCE.

FOURTH DAY'S PROCEEDINGS.

(Concluded.)

The President then introduced for discussion the subject of the rotation of cotton with other crops, particularly with sugar-cane.

ROTATION OF COTTON.

Mr. A. O. Thurston (St. Kitts) thought that the sugar industry suffered to some extent through cotton being grown in rotation. He thought the land derived more benefit if leguminous cover crops were planted instead.

Mr. J. R. Yearwood (St. Kitts) said that pigeon peas used to be planted, but the practice was different now.

Mr. F. R. Shepherd (St. Kitts) said that where cotton is planted at the right time, and taken off at the right time, it can be advantageously rotated with sugar-cane. He referred to the success which had attended this practice at Brighton and Douglas estates.

The President thought it was necessary to draw a distinction between the St. Kitts practice of planting cane after cotton, and regular rotation. As arising out of the discussion, he thought it would be opportune if Mr. Harland (St. Vincent) read some notes he had prepared on the Anderson Oil Expeller, now operating in St. Vincent The object of this appliance was to secure for manurial purposes a quantity of cotton-seed meal, and at the same time to increase the returns from cotton cultivation by extracting and exporting the oil.

Mr. Harland then read a paper describing the appliance.

The President pointed out that the machine operates on the principle of the ordinary meat mincer. The machine is very effective, very simple, and affords an example of a finishing process whereby raw material is converted into a useful product.

The Conference then adjourned for luncheon.

HABITS OF GROWTH OF THE COTTON PLANT.

On resuming, the President asked Mr. Nowell to take up the question of the branching habit of different types of cotton.

In proceeding, Mr. Nowell said that the habit of growth of the cotton plant was a subject which had a very important bearing on certain questions of cotton cultivation. Mr. Nowell then described the sympodial type of branching, in which reproductive branches only are produced all the way up the stem: this type is obviously in a better position to produce its crop early than a type in which a considerable period in the plant's development is spent in producing from the lower axils, branches comparable with the main stems. Attention had been given to the subject in America where they had to develop this so-called single stalk cotton as a protection against the boll weevil, and also in dry districts where the period of growth was so short that the ordinary cotton plant does not have time to set enough flowers to give a good result. It had been stated during the Conference that such a type of cotton is found in the St. Vincent strain known as B.S. This had the purely sympodial habit impressed upon it by heredity and not by cultivation as in the case of single stalk cotton in United States. Mr. Nowell pointed out that the cultivation of this type in districts where the internal boll disease is prevalent would be one of the ways of circumventing that disease.

Mr. S. C. Harland (St. Vincent) quoted a case where seed of the sympodial or single stalk type had yielded at the rate of 400 lb. of seed-cotton per acre, while ordinary Sea Island cotton near by had given only 10 lb. of clean seed cotton from 5 acres.

Mr. Shepherd (St. Kitts) pointed out that the St. Kitts strains possessed to some extent the characteristics of the single stalk cotton in regard to early maturity and high productivity.

Mr. A. O. Thurston (St. Kitts) thought it would be very beneficial if they could produce in St. Kitts a quicker bearing cotton even by a month.

Mr. K. P Pencheon (Montserrat) said he would like to try the single stalk type in that island.

In concluding this discussion it was emphasized by Mr. Ballou and Mr. Nowell, that the cultivation of the single stalk cotton was principally advocated with a view to providing a means of combating a specific pest, namely the cotton stainer, just as in the Southern States the single stalk cotton was evolved with a view to circumventing the boll weevil.

The present session of the Conference was brought to a close with the President reading an extract dealing with the economic status of the Sea Island cotton industry in America, in which it was stated that it is not advisable for American planters to increase the area of Sea Island cotton under present conditions.

The Conference was then adjourned to 10 a.m. the next day, Friday, March 17.

On resuming, the Hon. R. L. Warneford said that as a result of the suggestion made by the President in regard to an alliance with the Fine Spinners and Doublers' Association, he begged to move the following resolution: 'That this Conference is of opinion that it is desirable that steps should be taken to secure the mutual interest of West Indian cotton growers and Fine Spinners, on the lines suggested by Dr. Watts at the meeting of the 16th instant, and hereby request him, as Imperial Commissioner of Agriculture, to take such steps as he thinks desirable to ascertain whether the Fine Spinners and Doublers' Association will be prepared to entertain proposals, on the lines of those suggestions'.

Hon. J. S. Hollings (Nevis) seconded the resolution, which was carried unanimously.

FORMATION OF COTTON GROWERS' ASSOCIATIONS.

Hon. R. L. Warneford (Antigua) formally moved the following resolution: 'That in view of the necessity for taking all precautions to maintain the quality of the cotton produced in the West Indian islands to safeguard the supply of seed, and generally to secure the safety of the industry and also the interest of growers, it is desirable that a Cotton Growers' Association should be formed in Antigua. And further that the delegates to the Cotton Conference are requested to bring this resolution to the notice of delegates from other cotton-growing islands with a view to securing similar action if possible'.

The resolution was adopted.

[Since the above resolution was put forward, a Cotton Growers' Association has been formed in Antigua.]

BUYING AND SELLING OF COTTON.

Mr. K. P. Pencheon (Montserrat) suggested that it might be possible to arrange for the buying of cotton by samples, and that sales would be facilitated if the British Cotton Growing Association could see their way to appoint an agent in the West Indies for that purpose. He thought

also, that it would be advantageous if a syndicate could be formed in England for the handling of West Indian cotton.

The President said he thought the idea of having an agent on the part of the Fine Spinners in the West Indies was a good one.

Acting on the advice given to the Imperial Commissioner by the President of the British Cotton Growing Association, it was resolved that in the opinion of the Conference it is not desirable that steps should be taken to obtain a guarantee for prices of cotton to be grown this year as was done last year. The Resolution was seconded and carried unanimously.

FURTHER DISCUSSION OF PESTS AND DISEASES.

The President said there were some points remaining from the previous discussion on this subject which were well worth taking up

Mr. H. A. Ballou (Imperial Department of Agriculture) then dealt with certain insect pests of cotton including the leaf-blister mite and cotton worm and the outbreak of cockroaches which had been experienced in St. Kitts. He mentioned also the grey weevil which eats young cotton plants. This pest occurs in Antigua, Tortola and Nevis. The use of the poisoned bait was suggested as a possible remedy, and hand collection was mentioned as the only known method of control.

Mr. F. R. Shepherd (St. Kitts) made a few observations on the destruction of stainers by spraying with kerosene oil.

Mr. H. A. Ballou said it was possible that some poison might be found suitable for cotton stainers. Orange juice from dead-ripe fruit had been found to be a good trap. After some discussion Mr. Ballou went on to call attention to the fact that the species of cotton stainer most prevalent in Montserrat and St. Vincent, the two islands where internal boll rot had attracted attention, was different from the cotton stainer prevalent in St. Kitts.

Some discussion then followed in connexion with the distribution of species of cotton stainers, and the trend of opinion was that internal boll rot existed irrespective of any particular species of cotton stainer.

The next subject dealt with was the use of starch and Paris green as an insecticide, especially in connexion with the corn ear-worm, and the arrowroot caterpillar. Mr. S. C. Harland (St. Vincent) described the work he had done in this connexion [see *Agricultural News*, Vol. XIV, No. 353]. It was pointed out that the disadvantage of lime was that in excessive amounts it is repellent to the insect, whereas starch is more attractive. Again starch has adhesive properties which lime has not. It was thought that where large quantities of insecticide had to be used, the starch mixture would be more expensive than the lime mixture.

Mr. S. W. Howes (Montserrat) expressed his intention of trying Mr. Harland's mixture on his estate, for which purpose he had now 40 acres in potatoes for the production of the necessary starch.

As a result of a remark by Mr. Howes, Mr. Ballou made a few observations regarding the remarkable powers of flight of the moth of the cotton worm. There was some suggestion that Montserrat was invaded from Antigua; Mr. Ballou was not disinclined to consider that this might occur.

Mr. W. Nowell (Imperial Department of Agriculture) then said a few words concerning the fungous diseases of cotton other than the internal boll disease. He asked that a clear distinction should be made between bacterial boll disease, which attacked the outside of the boll, and the internal boll disease, which attacked the inside and was the one that was conveyed by cotton stainers.

(To be continued.)

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates May 15 and 27, 1916, respectively, with reference to the sales of West Indian Sea Island cotton:—

About 150 bales of West Indian Sea Island cotton have been sold since our last report at steady prices. The sales comprise Montserrat 16½*d.* to 18*d.*, and a few Nevis 15½ to 16*d.*

A fair business has been done in West Indian Sea Island cotton since our last report and prices are steady.

The sales include Montserrat 17*d.* to 17½*d.*, St. Kitts at 19*d.*, Anguilla 15*d.* to 18*d.*; also about 30 bales Stains to 11*d.* to 13*d.*

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 3, 1916, is as follows:—

ISLANDS. This crop has been entirely disposed of, there being no stock either here or on plantation. Consequently the market is closed until October, when the new crop will begin to come to market. The quotations are nominal, and are based on prices last paid, viz:—

Extra Fine 31c. to 32c. = 20½*d.* to 21*d.* c.i.f. & 5 per cent.
Fully Fine 30c. = 20*d.* ,, ,, ,, ,,

FLORIDAS AND GEORGIAS. The market has continued very firm with quite sufficient demand to take the limited offerings on the Savannah market.

Besides, sales aggregating about 2,000 bales have been made in the interior towns. It is probable that in some instances concessions in price were obtained when the buyer took all grades admitting of the holder getting rid of the entire lot.

The buying was on account of the Northern and Southern Mills, which will require further supply before the next crop is marketed.

We quote, viz.:—

Fancy	31c. = 32¼c.,	landed.
Extra Choice	30c. = 31¼c.,	,,
Choice	29c. = 30¼c.,	,,

The exports from Savannah since May 6 were, to Northern Mills 489 bales, Southern Mills 517 bales, and from Jacksonville to Northern Mills 933 bales.

CROP ADVICES. Since our last report of May 6 we have had beneficial rains over the entire Sea Island belt, which has admitted of good stands being obtained. The crop is reported to be in excellent condition, the advices from all sections being favourable.

As to the acreage, we have only to confirm our last advices.

More attention has been paid to seed in Florida and Georgia. In Carolina a large percentage of the crop has been planted in prolific seed classing only fine to fully fine; consequently the supply of Extra fine and above will be more limited.

Estimates of the entire crop, Florida, Georgia and Carolina range around 100,000 bales.

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester up to June 3, 1916, were 754 and 443 bales, respectively.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editoral in this issue calls attention to the shortage of pigs, and to the necessity for increasing the local supply.

The approach of the hurricane season has made it desirable to publish (on page 210) an article showing the signs which indicate the movement of these storms.

On pages 214 and 215 the fourth day's proceedings of the Cotton Conference are concluded and part of the fifth day's is given, in summarized form.

Insect Notes constitute a continuation of the article on the native food plants of the cotton stainer: another article deals with cacao thrips and die-back in St. Vincent.

An interesting note on the composition of milk in the tropics will be found on page 223.

Manuring the Sugar-cane in the West Indies

More experiments have probably been done in the West Indies on the manuring of the sugar-cane than on any other problem. The work has been carried on for a large number of years in the Leeward Islands (Antigua and St. Kitts), in Barbados, in British Guiana, and of recent years in Trinidad. Very few people, however, have a clear idea of the exact conclusions drawn from this work: consequently an article in the current issue of the *West Indian Bulletin* entitled, A Summary of the Manurial Experiments with Sugar-cane in the West Indies, by Mr. W. R. Dunlop, of the Imperial Department of Agriculture, should prove useful to planters and investigators alike.

This article shows that the remnuerative manuring of the sugar-cane depends largely upon local conditions and circumstances. It is not possible to make many generalizations for the whole of the West Indies: indeed, considering the great variation in local conditions, it would be surprising if this were possible. There is one general statement that may be made, however, and that is that nitrogen appears to be the principal constituent governing the yield of the crop in question. The use of artificial nitrogenous manures generally pays. The extent depends upon whether one is dealing with plant canes or ratoons, the amount of pen manure available, soil conditions, rainfall, and the price of sugar. The importance of maintaining the humus content of the soil by the application of pen manure and green dressings is indicated.

As regards the reliability of the results inferred from the mass of figures that have accumulated, it appears, from a mathematical examination, that if we are satisfied with a 10:1 chance that the differences produced by manuring are significant, the experiments, generally speaking, may be regarded as yielding reliable results to the extent of always coming true nine times out of ten.

It is desirable that the manager of every estate should consider his scheme of manuring in all its aspects, on the basis of the information in the article referred to above, and decide according to probable seasonal conditions, what form of treatment it is best to adopt.

Manuring of Cacao in Ceylon.

In the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for January 1916, are recorded the results of experiments in the manuring of cacao conducted at Peradeniya. The plots used contained a mixed variety of cacao—Forastero, Caracas and Amelonado, the first-named predominating. Various manures including artificial and organic were applied annually from 1902 to 1911 when all manuring was stopped.

The conclusions drawn from the results, briefly stated, are as follows: Ammonium sulphate gave the best results for the six years manuring and the yield increased during the first year after manuring had ceased, and then fell off rapidly. Similarly with potassium chloride, while potassium sulphate had

a more lasting effect both alone and in combination with precipitated phosphate. The effect of fish manure was marked for one year after the manure stopped, but the yield then fell off rapidly. Castor cake alone, or with basic slag had a more lasting effect than ground nut cake alone, or with potassium sulphate. Blood meal also had a good effect over two years after the last application, this plot rising to the second place. The three plots receiving organic manures (blood meal and castor cake alone, or with basic slag) gave the best results throughout the whole period, and it would appear that this is the best form of applying nitrogen to cacao.

It might be observed in connexion with the last conclusion reached, that in the West Indies—notably in Demerara, Dominica, and Grenada—it has been demonstrated that mulching is by far the best manurial treatment for cacao. The effect is not merely shown in greatly increased yields of cacao, but in a larger development and more healthy appearance of the trees.

The British Sugar Industry.

The *West India Committee Circular* for May 18 last, gives prominence to a notable address by Mr. W. M. Hughes, Prime Minister of Australia, delivered at the inaugural meeting of a Conference held at Glasgow, under the auspices of the newly-formed British Empire Producers' Organization. This Conference has been attended by sugar producers from, or connected with, India, Australia, the British West Indies, Natal and Mauritius, and it is hoped that when a policy has been clearly defined and the constitution is complete, the new Organization the establishment of which should obviate the need for the formation of the proposed British Sugar League, will receive the cordial support—financial and otherwise—of every sugar-growing part of the Empire.

In the course of an impressive speech Mr. Hughes briefly stated the object of the Organization, as he understood it, to be this: to make Great Britain in particular, and the Empire generally, independent of foreign producers, and especially enemy producers, as far as sugar was concerned. He pointed out that in dealing with sugar production they were really not concerned with one industry alone, but with many which expanded and spread outward until they were enveloped in the great ocean of British industry. In the operation of buying up sugar on behalf of the Commonwealth Government to supplement their home sources of supply he had the conviction forced upon him, that there was absolutely no reason why the Empire should not supply the whole of its own requirements in sugar. What we had now to consider was what kind of policy was necessary to conserve the industrial and commercial welfare of the nation, and the happiness and well-being of the people concerned.

Nothing more need be said, declared Mr. Hughes, in condemnation of the existing policy, than that while it sought to meet the industrial situation, it made no provision whatever for the production of food for the people in these islands, or to encourage its production in other parts of the Empire. It was a policy which had driven colonial lands out of sugar production and encouraged those who had been our prospective enemies, and were now our actual enemies, to produce the sugar required for British consumption.

Mr. Hughes pointed to the danger, when the war was over and peace was declared, of Germany and Austria dumping their accumulated stocks of beet sugar upon the English market and the markets of other British countries, and said that the only way to avert that danger was to prepare to meet it now. It was no good waiting until the war was over to begin to safeguard our sugar supplies. The sugar production and supply was, after all, a question that must be settled on a business basis by business men. He was of opinion that duties alone would not avail to safeguard the industry in its early stages. The only way he could see to safeguard the industry in its infancy, was for the British Government to enter into a series of agreements with the sugar producers and manufacturers of England and the Dominions, under which they would be guaranteed by the Imperial Government a minimum price for a minimum quantity. In concluding he emphasized the necessity, in founding this sugar industry, of taking into consideration the labour question as well as the producers' and manufacturers' interests, because if the industry was to be sound, it must rest upon a solid national basis.

The Reason for High Sugar Prices.

It is well known that the cessation of the German and Austrian exportation of sugar, and German occupation in France, have rendered Great Britain and her Ally dependent upon cane-producing countries for most of their immediate supplies. It is chiefly to the United States and Cuba they have turned for their requirements. The output of the United States, Mexico, Cuba, Porto Rico, Hawaii and the Philippine Islands is nearly 5,000,000 tons. For the continental United States it is estimated nearly 4,000,000 tons will be needed, which will leave in round numbers 1,000,000 tons for shipment to England and France. Great Britain consumed over 1½ million tons of sugar in 1915, while France used 700,000 tons, making a total of nearly 2½ million tons. Although Java and various British colonies like Mauritius and the West Indies have assisted in the supply of sugar to Great Britain, this has only been done in response to an urgent demand which has naturally been accompanied by high prices. It is stated in the *Louisiana Planter* in regard to the prospects for the Cuban crop of 1917, that reports received from that island tell of a rainfall during the past two months (April and May) that has not been sufficient to allow the cane to reach its normal mid-June development. So, despite the new plantings that are also reported, it seems entirely probable that Cuba's 1917 crop may fall below the one whose harvest is now most completed. There is good reason to believe that next year, therefore, in spite of the increased area under cane in many tropical countries, the price of sugar will be maintained at the extraordinarily high level experienced during the past season.

INSECT NOTES.

NATIVE FOOD PLANTS AND FEEDING HABITS OF THE COTTON STAINER IN ST. VINCENT.

(Concluded.)

The following is the concluding part of the notes published in the last issue of the *Agricultural News* dealing with the native food plants of the cotton stainer in general, and one of them, the silk-cotton tree, in particular. The present notes concern the 'John Bull' tree (*Thespesia populnea*, Corr.).

This medium-sized tree is known locally under four vernacular names, these are: 'John Bull', 'Mahoe', 'Gamboge', 'Bermuda Cedar'. It occurs more frequently along a part of the Windward District which starts at Stubbs village and extends to Langley Park estate, than in any other part of the island Its numbers are constantly being added to here owing to the fact that the people use the branches as 'live' posts for fences, boundary marks, and wind-breaks. In the Leeward District, and also in the farther portion of the Windward District, the tree has been destroyed to a considerable extent on account of its harbouring cotton stainers. It produces flowers on young shoots. The first flower on a branch opens in February and the last in April, as far as can be judged at present. About ten flowers are produced on each fruiting shoot of the current season's growth. Each flower gives rise to a fruit which ripens two months later. The ripe, leathery, circular, capsular fruit measures $1\frac{1}{2}$ to $1\frac{3}{4}$ inches in diameter and $\frac{3}{4}$-inch in depth, and contains a number of seeds which are slightly larger than those of Sea Island cotton. The seed is thinly covered with a short downy fuzz. The walls of the young fruit contain a yellow resinous liquid, from which the tree obtains the name of 'Gamboge'. The fruit never opens to liberate the seed except by the decay of the leathery covering, and persists on the branch for a year or more before it drops off, so that in the month of April there may be no less than twenty fruits, old and young, on each small branch. By the time the young capsules are ripe, the shells of those of the previous season commence to crack as a result of age, and openings appear usually roundabout the base of the fruit The important point which it is desired to bring out here is that the 'John Bull' tree at all times carries a very large number of seed vessels containing food on which the cotton stainer can live.

It was mentioned in the earlier part of this article that the cotton stainers left the fields about the time the cotton stalks were pulled up. In districts where there were silk-cotton trees they awaited the bolling of the trees, as has been described. In districts where there were no silk-cotton trees, but 'John Bull' trees, some of the stainers very quickly made their way to these trees, especially if they were close at hand. At the middle of April only a few stainers were found away from 'John Bull' trees, and these were all on a few isolated trees of the 'Horse Radish' tree (*Moringa pterygosperma*). Here they were feeding on the nectar of the flowers, but were not breeding, and not a single young bug was observed. All the evidence collected, pointed to the fact that it was at the end of February that the insects left the cotton fields, or about the time the cotton stalks were being destroyed.

In the month of April on every fruiting 'John Bull' tree there were thousands of insects, both mature and immature, feeding on the old and young fruit. A favourite place for the young stainers was the old cracked fruit, and at times a swarm of them would emerge from such a fruit when opened. The people of the district therefore, state that the 'pods breed the stainer bug', and it may be that the mature insects actually lay their eggs in the cracks of the old shells and the young on hatching out feed on the seed; but eggs so laid have not yet been found. Whereas no insects were seen to be breeding on other plants examined, they were breeding very freely on the 'John Bull' tree, and the conclusion arrived at is, that the tree is an even greater menace to the Sea Island cotton industry than the silk-cotton tree, and that both should be destroyed or systematically prevented from fruiting.

When it is mentioned that cotton planting was started in April close to a large number of badly infected 'John Bull' trees, it will be realized that unless the tree is destroyed, it will be impossible to prevent the cotton stainer from badly damaging the valuable Sea Island cotton crop.

An examination was made of the fruit of the 'John Bull' tree attacked by the stainer in order to ascertain, if possible, whether the insect induced a disease. No trace of disease was found, but there were proliferations of the walls of the fruit and damaged seed.

There are few natural enemies of the cotton stainer. So far, the chief one observed was the 'Pipiri' or 'Hawk-beater' (*Tyrannus rostratus*). Stomachs of this bird were examined and each was found to contain a large number of these insects. Other birds which prey on the bug to a limited extent are the 'Black bird' or 'Bequia Sweet' (*Quiscalus luminosus*); the 'Tick bird' (*Crotophaga ani*), and domestic fowls. A small mite, externally parasitic on the stainer, was frequently seen, but appears to be of little importance. A few dead stainers on which live ones were feeding have also been noticed, but the cause of death could not be ascertained.

As a result of these investigations, it is suggested that the control of the local cotton stainer will depend primarily on:—

(a) The destruction of all the old cotton stalks as early as possible after picking is finished in each season.

(b) The destruction or pruning back of all fruiting 'silk cotton' and 'John Bull' trees.

These operations can be readily carried out. The control of the cotton stainer after it has entered the cotton field is a difficult matter, but it ought to be far easier to solve this question in the near future, provided the suggestions made are carefully followed throughout St. Vincent and a close season for cotton, say, from February to May, is instituted.

Investigation work on the drugs and poisonous plants of South Africa has been proceeding for some time at the Imperial Institute, and in the current number of the Bulletin of the Imperial Institute is published a summary of these investigations as far as completed. The results obtained are interesting and valuable. Boltono disease (a cattle and horse disease prevalent in certain parts of the Union of South Africa,) has been definitely traced to the presence of a poisonous alkaloid in a plant eaten by the animals. This plant is *Senecio latifolius*, a near relative of the common groundsel of Great Britain. 'Cape slangkop', a plant belonging to the lily family, which causes cattle poison in the other districts of the Union, contains a poisonous glucoside similar in action to that found in the common foxglove. Among other South African plants of which the properties are still being investigated at the Imperial Institute are the roots of the 'Ntsema', which are said to be extensively used by the natives employed on the Witwatersrand mines in the preparation of an intoxicating drink known as 'kali'.

A NEW MOTOR SPIRIT FROM MOLASSES.

Alcohol has for many years been experimented with as a substitute for petrol, but its use has been open to objection on account of the fact that an engine built for the use of petrol is not quite suitable for a fuel of so high a density as alcohol; moreover, alcohol has been considered to be insufficiently volatile, of insufficient calorific value, and above all, it has been found to corrode the engine through the formation of acid during the process of combustion. During 1914, the inventors of a new motor spirit, known commercially as Natalite, succeeded in overcoming all the objections, the three first by converting a large percentage of the alcohol into ether, thereby reducing the density, increasing the volatility, and increasing the value to practically that of petrol; corrosion was overcome by the use of an alkali which, during the process of combustion, neutralizes the acids produced by the alcohol and ether.

Natalite is prepared from molasses, and it has been subjected to properly conducted tests by various authorities, the report of one being given below. In the Natal *Agricultural News* for March 15, 1916, there is a prospectus of the newly formed company which is about to manufacture this new fuel on a commercial basis. The name of the company is the South African Natalite Motor Spirit Company, Ltd. It has a capital of £75,000.

It is estimated that a complete plant including buildings required to make in the aggregate 2,000,000 gallons of Natalite per annum would cost £36,000. This plant would enable the company to turn out 6,000 gallons of Natalite per day.

Certificates are published from the Royal Automobile Club, London, from the late Professor Vivian B. Lewes, from Professor Demmison, Professor of Chemistry at the Natal University College, and from Professors Hahn and Rindl. The report of the Royal Automobile Club runs as follows:—

Certificate of Performance (under the Open Competition Rules of the R.A.C., No. 423) in a test of Natalite Fuel, May 13 to May 15, 1915.

This is to certify that a sample of 'Natalite' Fuel was entered by Messrs. The Natalite Motor Spirit Company, Limited, of Durban, Natal, for a 500 miles consumption test.

The fuel appeared to consist of alcohol and ether, about 0 per cent. of ether being present. Methyl alcohol was present probably as a denaturant. The result of a distillation test was as follows :—

Distilled below		Distilled below		Distilled below	
0 per cent.	46° C.	40 per cent.	74° C.	70 per cent.	78°C.
0 „ „	54° C.	50 „ „	77° C.	80 „ „	79°C.
0 „ „	64° C.	60 „ „	78° C.	90 „ „	83°C.

Specific gravity at 15·5° C. (hydrometer) 0·783

The car used was a 22 h.p. (22·4 R.A.C. Rating) Charron car, reputed year 1910. The car weighed 3,640 lb. (32½ cwt.) with passengers.

The trial was held upon three of the Club's six standard routes, and the distance covered was 501¾ miles. The weather was very wet on the first day. The cape hood was in use all the day, and the roads were heavy. The other two days were fine.

The dimensions of the engine were 95 mm. by 130 mm. (4 cylinders). The volume swept by the piston was 921·47 c.c., while the volume of the combustion chamber was 343 c.c., giving a compression ratio of 3·7. The carburetter used was a Solex.

The amount of fuel used was 30·59 gallons, being a consumption of 16·40 miles per gallon, or 26·20 ton miles per gallon.

The engine on all occasions started easily from cold or when warm.

The valve caps and valve heads were found to be very clean after the trial. The rest of the engine was not dismantled.

It would seem that enterprise on the part of South Africa will stimulate similar efforts to utilize molasses in Cuba and other places in the West Indies.

THE BIRDS OF PORTO RICO.

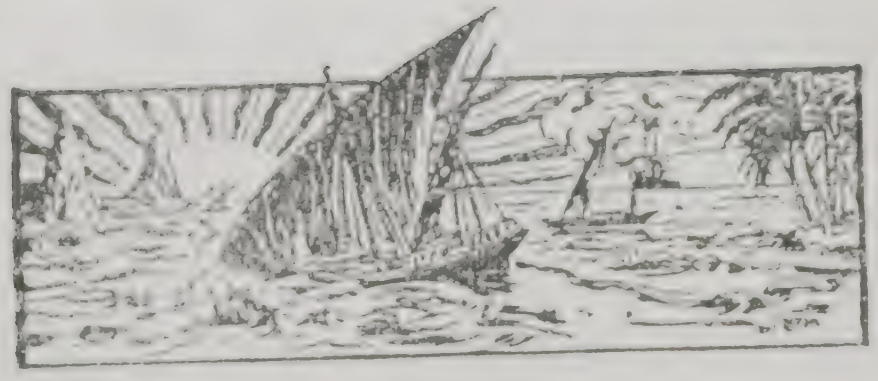
The Rev. Dawson, in his article in our last issue on Economic Aviculture refers to Bulletin No. 326 on the Birds of Porto Rico, issued by the Bureau of Biological Survey of the United States Department of Agriculture. This publication contains a large amount of information and is worth further noting. In the first place it gives a complete list of the different species of birds with an account of their habitats and of their foods. From an economic stand-point, a section of great interest is that dealing with species commonly found in cane fields, coffee plantations, and citrus groves.

In regard to the birds of cane fields, it is stated that no bird harms the cane in any way; those that are not directly beneficial by destroying insects, and to a less extent weed seed, are neutral and do no damage. During most of the year, only adult insects of the important pests are available, immature forms being exposed mainly at ploughing time. To see a flock of blackbirds (*Holoquiscalus brachypterus*) at that season following closely in the furrows behind the plough, eating greedily and carrying food to their young, emphasizes their value. Other beneficial birds in cane fields are *Crotophaga ani* and one of the Tyrant birds.

In regard to citrus groves, it is stated that a few birds were seen eating oranges, but in every case they attack only wild fruit that was dead-ripe and beginning to soften. Quail doves peck open the rotting sweet oranges for the seeds as they lay on the ground, but no birds were found attacking sound fruit in the groves.

Turning to another section in the paper of great economic interest, namely, the bird enemies of different pests, we learn that the blackbird is not such a useful species in destroying mole-crickets as the somewhat despised *Butorides v. cubanus.* The bird enemies of the sugar-cane root borer include the blackbird, the larger fly catchers, and several others. In regard to the May beetle (*Luchnosterna* sp.) the locally termed bird Mucaro (*Gymnasio n. nudipes*) is by far the most important, and by its nocturnal habits can successfully cope with adults when they are flying.

The number of resident species of birds in Porto Rico are, in common with other West Indian islands, few At the same time the census shows a fairly dense population. To encourage birds it is pointed out in the Bulletin under review that it is necessary to provide shelter and perches. In the cane fields, it is stated, stakes should be planted, and in places where birds are required, it is always necessary to provide them with shelter from the burning heat of the mid-day sun. Another matter which requires attention in connexion with the control of bird life is legislation. Legal protection must be provided, but before this can be done efficiently, it must be known to what extent some birds are beneficial and others noxious. As an aid in the enforcement of protective laws no method is of more value than the education of school children to look on birds as friends and not to disturb them.



GLEANINGS.

We have been informed by the Agricultural Superintendent, St. Vincent, that two more agricultural co-operative societies have recently been registered in that island under the Act, making fourteen in all with a membership of nearly 500. The Co-operative credit societies movement appears to be progressing satisfactorily in St. Vincent.

We have received a copy of the proceedings of an Agricultural Congress in Guadeloupe (Second Session, 1915). This contains a large number of recommendations, including the suggested foundation of an agricultural journal in the Colony and the improvement of the experiment station at Pointe-a-Pitre. It is not clear, however, who are expected to carry out the recommendations of the Congress.

A note on dipping tanks in the *Rhodesia Agricultural Journal* for February 1916, recommends that before cattle are put through a new tank it is advisable to mix 10 lb. of bitter aloes in the tank and send the animals through before putting them through the dips. This minimises the chance of cattle drinking any dip afterwards, for if they get a mouthful of bitter aloes, their own sense tells them to keep their mouths closed afterwards.

The Department of Agriculture in Mauritius has issued a Bulletin (No. 6) on the irrigation of sugar-cane in Mauritius. It appears that water for irrigation purposes will be shortly available, and this Bulletin deals with the principles governing the wetting, washing of soils, amount of water to be applied, etc.,—in other words, with the estate or purely agricultural side and not the engineering side of irrigation. It should prove of much value to the planter.

The various details of manipulation in the Babcock test for milk and dairy products, are fully described in Bulletin No. 45, Dairy and Cold Storage Series (Department of Agriculture, Ottawa, Canada). While the Babcock test is very simple to understand and operate, great care and accuracy must be exercised in all details of the work, or the results will be inaccurate and misleading. It has been truly said, that in operating the Babcock test there is more to learn in care than in principle.

An annual review of the rubber industry in the *India Rubber Journal* for January 15, 1916, points out that Hevea is the predominant type in practically all plantation rubber districts to-day. A few years ago very many estates had Castilloa and Ceara: there are now only a small number of Ceara trees left, Castilloa having entirely disappeared. Ceara, though it yields good rubber does not yield satisfactory crops. It is urged that Departments of Agriculture should give more attention to improving the strain of Hevea trees by seed selection.

Co-operative credit in Mysore is dealt with in the *Mysore Agricultural Calendar* for 1916. The department which administers co-operative credit societies (Raiffeisen type) in this State has a staff of twenty-four inspectors and forty-two honorary supervisors to spread the movement. At the close of the year 1914-15, there were 725 co-operative societies in the State, of which 683 were societies for credit, and forty-two were societies for other purposes.

The composition of the avocado pear is referred to in a note in the *Experiment Station Record*, Vol. XXXIII, No. 4. The approximate composition of the edible portion, constituting 65·7 per cent. of the fruit is as follows: water, 69·16 per cent.; protein, 2·08 per cent.; fat, 20·1 per cent; carbohydrates, 7·39 per cent.; and ash, 1·26 per cent. The average energy value found was 984 calories per lb. or more than twice the maximum noted for any other fruit. The value of the avocado as food is chiefly due to its high fat content. It is assumed that the avocado is thoroughly digestible.

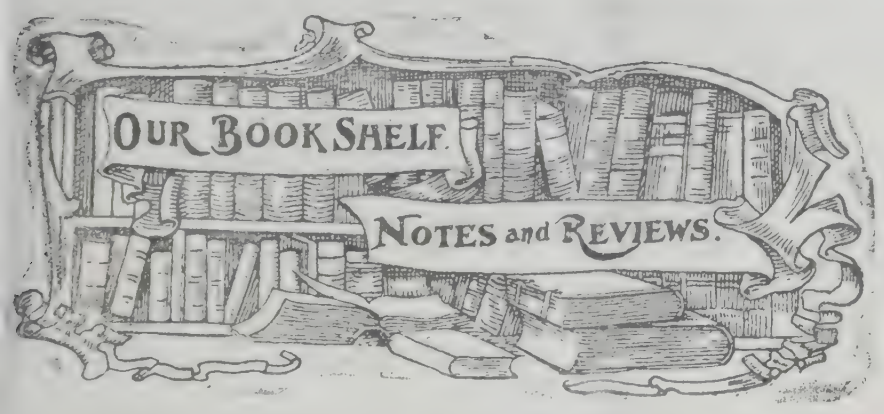
It is reported in *The Times* of May 4, that at a meeting called by the Committee on Neglect of Science, of which Sir. E. Ray Lanxaster is Chairman, the following resolution was moved and carried:—

'That it is in the highest degree desirable that the Government should exercise the large power which it possesses of encouraging the study of the natural sciences and thereby increasing the efficiency of our public servants (1) by assigning capital importance to the natural sciences in the competitive examinations for the home, Indian, foreign and colonial Civil Service, (2) by requiring some knowledge of the natural sciences from all candidates for admission to Sandhurst.'

In the same issue a letter appears on the limitations of science, putting forward a plea for the study of Latin and Greek on account of the educational value of tradition.

Of interest to many people in the Leeward and Turks Islands, where a salt industry exists, will be a paper in the *Philippine Journal of Science* (Vol. X, Sec. A, No. 6) on the Philippine salt industry and resources. This calls attention to the value of adopting different stages of evaporation with a view to eliminating by crystallization salt impurities and the ultimate production of 99·63 per cent. sodium chloride. An interesting diagram indicating the deposition of salt from sea-water is given: this shows that calcium sulphate (gypsum) is the first impurity deposited, and finally magnesium chloride and sulphate. It is worth noting that in this process of fractional crystallization in a series of reservoirs, a considerable amount of potassium chloride and sulphate, which should be of value for manurial purposes, is obtained.

Readers who are interested in the culture of Bougainvillaeas will be glad to hear that these plants have been receiving special attention by the Department of Science and Agriculture in British Guiana. The crimson Bougainvillaea has been successfully raised from cuttings: the plant flowers twice a year, once in April or May and again in October or November. It is a native of Colombia, and is at present an unnamed species. It is to be seen commonly in many the British West Indian islands. The British Guiana collection comprises two other species: *B. sanderiana* and *B. lateritia*. The first-named species is purple-flowered, and is a perpetual flowerer, while the other species have definite flowering periods. *B. sanderiana* grows readily from root cuttings; the crimson-flowered species is perhaps most easily propagated by stem cuttings.



PRODUCTIVE FARM CROPS. By Professor E. G. Montgommery (Cornell University). *J. B. Lippincott Co., Philadelphia and London.* Pp. 512, Figs. 203. Price 7*s.* 6*d.* net.

This book gives a good practical account of the characters, cultivation and harvesting of the principal crops grown in the United States. Several of these are also produced in the West Indies, and from this point of view, the book under review is of interest to the West Indian planter. In Chapter I, a diagram shows that by far the most valuable crop produced in the States is Indian corn; it is worth over twice as much as the American cotton crop, which, in itself, is of greater value than the American wheat crop, and vastly greater than the value of the potato or tobacco crop.

INDIAN CORN.

As regards the crossing of corn it is pointed out that the effect of crossing on vigour and yield is very marked. When seed has been fertilized by pollen from the same plant it usually produces smaller plants than hybrid ears. It is stated that the yield is usually reduced about one-half by inbreeding. In nature, most of the corn is pollenized by other than its own pollen, but at least some kernels must be self-fertilized on each ear. These self-fertilized kernels probably account for many of the small or barren stalks in fields. A useful feature of this book is the provision of exercises at the end of each chapter; thus in connexion with corn selection, instructions are given for class selection from 100 seed ears, and for the study of the germinating quality of corn. In dealing with the preparation of land for corn, it is stated that there is no object in planting corn deeper that is necessary to ensure good germination: 2 or 3 inches is generally enough, but much depends upon the physical character of the soil and the rainfall. In colonial days, corn was an important article of food in North America and was generally used. It is stated, however, that with the development of wheat culture corn has been almost entirely superseded in all but the Southern States. In the South, corn bread is still used extensively. The more extensive employment of corn as food, particularly in the form of vegetables, is to be encouraged. Chapter XIV, which is the last one out of eight dealing with this important crop, concerns the judging of corn. Fancy ears are illustrated and special points enumerated. This chapter should prove of interest in the West Indies in connexion with maize shows.

COTTON.

The next crop dealt with in this book that requires consideration from a West Indian point of view is cotton. It is pointed out that cotton is the leading cash crop of the country, being one of those which are converted directly and entirely into money. In the description of the cotton plant some space is devoted to the characters of the fibres. It is stated that the tensile strength is usually represented by 6 to 8 grammes, but extreme breaking weights of 4 to 14 grammes have been found. The author classifies cotton into unripe, half ripe, and ripe, each condition being judged by the amount of twist, the ripe cotton having most twist. The author states somewhat crudely, that the value of cotton fibre is determined by its colour, length, tensile strength, ripeness, fineness, and uniformity. Next is discussed the utilization of cotton by-products, and in this connexion it may be noted that cotton-seed hulls are used in the manufacture of paper and fibre-board. In the United States it is apparently the case that cotton culture requires the application of large amounts of fertilizers, a condition which does not hold good in the West Indies. As a matter of fact it is characteristic of the book under review rather to over emphasize the value of fertilizers in the production of crops. The remunerative use of manure is almost everywhere to a large extent a matter of speculation, and it would seem that more is written concerning fertilizers than is desirable, considering that every estate has to decide for itself what it requires, by the conditions existing at any one time. The author states that the enormous increase in the production of cotton in the United States is due chiefly to the use of commercial fertilizers; we should have thought that it has been due rather to the effective control of the cotton boll weevil—a subject on which the author has very little to say.

In regard to the picking of cotton it may be of interest to record the fact that in the States, the cost of this operation varies from 50c. to 75c. per 100 lb. of seed-cotton, this being equivalent to about $1\frac{1}{2}$ to $4\frac{1}{4}$c. per lb. of lint. The amount of seed-cotton which one person can pick in a day varies usually from 100 lb. to 500 lb., depending on the skill of the labourer, and the yield of the plants.

SORGHUMS, SWEET POTATOES, PEANUTS AND TOBACCO.

A class of crop which might be more widely utilized in dry districts in the West Indies is the Sorghums. Their cultivation, etc., are dealt with in this book. It is explained that the reason why sorghum is more drought-resistant than Indian corn, is because the sorghums can stand short periods of drought and immediately become revived on the receipt of rain. Corn, on the other hand, would often be killed by these spells of drought. Sorghum is grown for four purposes: grain, forage, syrup and broom bush.

Chapter XXXII deals with sweet potatoes, and a map is given to show the range of production in the Southern States, running right round from California through Southern Texas, up to Virginia. It appears that in the States the crop is sometimes planted from the smaller sized potatoes sorted from the main crop. Special storage houses are used for curing the root.

A large amount of information is given in this book regarding forage crops, but apart from the references to Bermuda grass, Johnson grass and Sudan grass, the crops dealt with are not grown in the West Indies. Similarly a detailed account is given of leguminous crops many of which are of interest only in connexion with agriculture under temperate conditions. Cowpeas, however, form a valuable crop in the States, as do also ground nuts or peanuts as the Americans call them. These latter, after harvest are 'shocked' on stakes in the field to dry and cure. There is a large consumption of peanuts in the United States in the form of baked nuts, and in the form of oil which is expressed.

The last chapter deals with tobacco. An account is given of the cheese—cloth shade method of production, and an illustration is given to show how seed beds may be sterilized by means of steam from a traction engine. Other interesting features of this chapter concern the care of the growing crop, and its curing—a matter which has been an obstacle to the production of small quantities of marketable tobacco in some of the smaller West Indian islands.

PLANT PESTS AND DISEASES.

CACAO THRIPS AND DIE-BACK IN ST. VINCENT.

In the last issue of this Journal an account was given of the general health conditions of cacao in St. Vincent, and of the conditions at 'Estate A'.

Discussion of the Situation at Estate A.

The soil at Estate A is deep and very light. In the case of one tree which was dug up for us, the tap root was followed to a depth of more than 5 feet, all the way through a light sandy soil free from stones, and apparently greatly wanting in organic matter.

It is very noticeable throughout the Estate A cacao, and in other localities as well, that the healthy trees almost without exception, were growing under the influence of shade, and the sickly (die-back or thrips) trees were commonly associated with a gap or break in the overhead canopy. In Grenada, where the soil is heavier and more retentive, the trees develop a more dense crown than is general at Estate A, and this aids in retaining in the immediate vicinity the moisture evaporated from the soil surface, thus helping to maintain atmospheric humidity. In St. Vincent, on the other hand, the thinner tops of the trees allow for the rapid rise of the evaporated moisture above the level of the cacao foliage, and this, together with the transpired moisture given off by the cacao leaves themselves, is dissipated and lost. In this way, the atmosphere of the cacao cultivation in St. Vincent is deprived of its moisture, and the trees experience the difficulties of growing in a dry atmosphere.

The function of shade in St. Vincent is, then, the production and maintenance of a greater degree of humidity than would normally occur. The deleterious effect of the removal or absence of shade is to be seen on nearly every estate we visited in St. Vincent.

Protection from wind is quite distinct from shade. Cacao always suffers when exposed to wind, and care should always be exercised to maintain wind-belts in addition to shade trees in exposed situations. At Estate A, however, natural protection from wind appears to be very good.

Remedial Measures.

Root disease. In the case of occurrence of root disease, the treatment should be that described at length in Pamphlet 79. pp. 24-35.

Die-back. Trees in which the die-back condition is noted, i.e., the trees suffering from repeated attacks of thrips where root disease is not to be found, should be given heavy dressings of pen manure and mulch. All open spots should be planted with cover plants such as bananas, plantains, tannias, and Gilricidia. An abundant top shade should be developed. Gliricidia will probably not give a sufficiently dense shade nor sufficient protection against loss of moisture. For this purpose it is not likely that a better tree can be found than the Immortel, although in St. Vincent it is attacked by scale insects and twig borers which sometimes interfere with its effectiveness. Gliricidia would be most useful as a filler for open spots along with tannia, banana, etc. Angelin (*Andira inermis*) might be usefully experimented with as a hedge for borders, as along roads, where there is room enough. Another form of hedge along roads, paths and traces, and around the borders of open patches might be supplied by the use of *Acalia Guilfoylei* planted very close, say 10 or 12 inches apart, and in double rows, the plants in one row alternating with those in the other. This form of hedge or screen is to be seen very well developed in many places in the northern part of Grenada, where it appears to be very effective.

Manurial Treatment.

We are of opinion that a definite scheme for manurial treatment and tillage ought to be worked out for St. Vincent cacao plantations on similar lines to those followed in Grenada. The details of such a method would vary from those in Grenada to conform to the different soil and climatic conditions existing in St. Vincent. We would suggest the following:—

1st year: Pen manure, bedded in.
2nd ,, Mulch, leaves and bush, bedded in.
3rd ,, Cotton-seed meal and basic slag.
4th ,, Mulch, leaves and bush, bedded in.

It is recognized that at the present time no large quantities of pen manure are available at Estate A, but it must be borne in mind that the great need of these lands is coarse organic manure, pen manure when it can be had, and bush and mulch of all kinds, with organic concentrates, to help out. Basic slag as a source of phosphate is suggested as likely to be a valuable aid. Once the necessity for organic manures is realized, it only becomes necesary to adopt a scheme which will ensure the regular treatment of the whole estate, and the four-year system mentioned above would appear to be the most applicable to the conditions existing Estate A. According to this, one-half the cacao under treatment will receive mulch each year, one-quarter pen manure and one-quarter cotton-seed meal and basic slag. It seems unlikely that at the present time a sufficient amount of pen manure is produced at Estate A to provide a suitable application to even one-quarter of the cacao. As large an area should be chosen as can be properly treated, and the scheme given above, or some other definite scheme of treatment, should be adopted and carried out. Additional areas should be brought in as increased amounts of manure become available.

Conditions on other Cacao Estates.

In all the other cacao visited we saw existing, to a greater or less extent, the condition of the trees which we have described as die-back.

At Estate B, both established trees and supplies were seen in this condition, and in various stages of recovery. The manager is well acquainted with the symptoms and is of the opinion, that given adequate shade and wind protection, the application of manure, either pen manure or mulch, or both, is sufficient to promote recovery. He exhibited to us several trees which had been severely affected, but had been revived by this means.

At Estate C, the cacao was generally in a healthy condition, except in some cases which could be attributed to a deficiency of shade. Thrips are not considered by the manager a serious pest, and the conditions favourable to their increase do not appear to exist under the agricultural methods in practice on this estate.

At Estate D, we saw cacao that was in poor condition, which was obviously due to exposure as a result of the complete removal of wind-belts and shade trees which had occurred under a former manager some five or six years previously. Vigorous measures towards restoring the former conditions in this respect are the first requirements on this estate.

At Estate E, we were informed that the unfavourable condition of the cacao was due to extensive removal of fairly dense shade. Root disease was remarkably absent, although the conditions were such as might have been expected to have led to serious outbreaks. This we regard as confirmative of our ideas as to the relatively dry conditions brought about by the nature of the St. Vincent soil, it being well established that root disease is directly dependent on the persistence of damp conditions. Even at Estate A, the type of root disease mostly found is that which occurs in Grenada in the relatively dry localities.

The adoption of a regular system of manurial treatment such as has been outlined for use at Estate A would be beneficial at Estate E; the restoration of proper conditions as to shade and wind-belts would seem to be a necessity.

It was suggested to the manager that trials should be made of contour trenches in a small way on one of the steeper slopes, for the conservation of surface water. At this place there is a substratum in the soil which probably causes a large amount of the surface water to run off. The suggested trenches should allow much of this water to penetrate into the soil.

At the Experiment Station, the small plot of cacao is in good health, and shows in rather a striking manner the validity of our contention with regard to thrips, since thrips are always present on a fruit tree adjacent to the plot, and are not able to penetrate within its border.

At the Botanic Gardens the trees in certain portions of the cacao plots are in an unsatisfactory condition for which we are not able adequately to account. In view, however, of all the accumulated evidence as stated above, we are not inclined to attribute this to the effects of the thrips attack without the action of some predisposing cause.

THE COMPOSITION OF MILK IN THE TROPICS.

In connexion with the article that appeared in this Journal a few months ago (April 22, 1916) on the composition of Dominica milk, it is of interest to notice two important papers on the subject of milk analysis, which have been issued by the Mauritius Department of Agriculture, and by the Agricultural Research Institute, Pusa, India, respectively; namely, the Composition of Milks of Mauritius, by G. C. Auchinleck, B.Sc., and the Detection of Added Water to Milk in India, by J. W. Leather, V.D, F.I.C. The first publication shows that in lactose, albuminoids and ash, Mauritian milks are lower than the average English and French milks, while in fats they are higher than the French and lower than the English average. The legal minimum percentage of fats in fresh milk offered for public sale is, in England, 3·0; for Mauritius, it is at present fixed at 2·5 per cent. The average percentage of fats in morning milks is lower than that of evening milks. This difference in composition is presumably due to the fact that the periods between the milkings are unequal.

In regard to the use of empirical formulæ for calculating one of the constituents when the two others are known, it is stated that Richmond's formula—

$$\text{Total solids} = 1{\cdot}2\ \text{fat} + {\cdot}25\ \text{gravity} + {\cdot}14$$

gives for Mauritian milks results too low in the case of total solids and too high in the case of fats. It is of interest to observe that the percentage of total solids and fats are lower in Mauritius milk than in that produced in Dominica in the West Indies.

The second publication, dealing with the detection of added water in milk in India concerns principally a method of determining this by means of freezing. It is stated that attention has lately been directed to both the refractive index of the milk serum, and to the freezing point of the milk for purposes of detecting added water. The former has not been used by the writer of the Bulletin under notice, but judging by published data, this method will hardly detect 10 per cent. of added water The latter method is stated to be more dependable, however, and has been used rather extensively. The formula is—

$$W = -174(-0{\cdot}542 - t)$$

where t is the freezing point and W the weight of water added.

As regards the accuracy of this method, it is stated that it has to be realized that any dairyman who waters his milk will not add so little as 5 per cent., it is unlikely that he would add less than some 10 to 20 per cent.; which assumption makes it quite certain that adulteration by water can be detected with certainty except in the improbable case of less than 5 per cent. being added when the freezing method is not reliable.

It is stated that this method is obviously very much more certain than the deduction from the percentage of solids-not-fat. With reference to the method of ascertaining the freezing point, little explanation is required in addition to the details commonly employed in cryoscopic determinations.

The writer, Mr. Leather, found it best to employ a bath of ice and salt solid, and to place the milk in a tube which, is itself in an outer empty tube, the latter being in contact with the bath. The temperature of the milk usually supercools from $1\frac{1}{2}^{\circ}$ to 2°; as soon as ice commences to form, the temperature rapidly rises to the true freezing point. Half-a-minute is allowed to elapse between each reading of the thermometer, and at the freezing point the variation of temperature is not more than 0·002 C. The thermometer should be steady within this limit for at least two minutes.

A note in the *International Review of the Science and Practice of Agriculture* states that plants watered with salt solution show varying degrees of difference from individuals of the same species watered with ordinary water. It is stated that the characters induced are transmitted; these are small size, smaller proportions of large seeds, reduced weight of the seed. These characters, however, can be found in plants growing under unfavourable conditions of any kind; consequently, in order to be able to settle the question definitely, more experiments are necessary.

The *West India Committee Circular* refers, in its issue for June 1, to the development of the Indian sugar industry as urged by *Tropical Life*. This latter journal points out that if the Indian Empire produced the 800,000 tons of white sugar that she at present imports, plus another 500,000 tons to send to the United Kingdom, she would be £26,000,000 a year richer at £20 a ton, and half as much again if calculated on a basis of £30 a ton; and to do this she has only to produce 2 tons of white sugar per acre as compared with over 4 tons per acre, the average return in Java.

MARKET REPORTS.

London.—The West India Committee Circular, June 1, 1916.

Arrowroot—2½*d.* to 4½*d.*
Balata—Sheet, 3*s.* 2*d.* to 3*s.* 4*d.*, block 2*s.* 6¼*d.*
Beeswax—No quotations.
Cacao—Trinidad, 90*s.*; Grenada, 76/6 to 85/6; Jamaica, 81/- to 84/-.
Coffee—Jamaica, 54/6 to 73/6.
Copra—£34.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 19*d.*
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, 115/-
Isinglass—No quotations.
Honey—45*s.* to 55*s.*
Lime Juice—Raw, no quotations.; concentrated, no quotations; Otto of limes (hand-pressed), 9/6.
Logwood—£8 to £8 10*s.*
Mace—7*d.* to 3*s.*
Nutmegs—9*d.* to 1*s.* 2*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/8¾; fine soft, 2/8; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 18, 1916.

Cacao—Venezuelan, $16·40 to $16·50; Trinidad, $15·40 to $15·75.
Coco-nut Oil—$1·10 per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c.
Copra—$6·50 per 100 lb.
Dhal—No quotations.
Onions—$5·00 to $5·50 per 100 lb.
Peas, Split—$9·00 to $9·25 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·25 to $7·50; White., $7·50 to $8·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., June 13, 1916. T. S. Garraway & Co., June 13, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$15·50 to $16·00 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda no quotations: Cacao [illegible] quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $4·50.
Peas, Split—$8·23 to $11·60 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $6·75 to $6·80 per 190 lb.; Patna, no quotations: Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·50.

British Guiana.—Messrs. Wieting & Richter, May 31, 1916; Messrs. Sandbach, Parker & Co. June 2, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	68c.
Cacao—Native	17c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$24 per M.
Coffee—Creole	13c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$6·75 to $7·00	$6·50 to $7·25
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	8c. to 11c.
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·00	$4·50 to $4·70
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$6·40 to $6·75
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $4·60	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$5·00 to $7·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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The Bad Germination of Seeds.

A CORRESPONDENT has recently complained of the bad germination of some imported vegetable seed, and is inclined to attribute the matter to the effects of fumigation. This idea of the ill-effects of fumigation is by no means an uncommon one, but it is quite unfounded, for the reason that imported vegetable seed is seldom fumigated, and even if it were, the methods employed would not injure the seeds to any serious extent. The causes of bad germination are to be found in other directions, and their consideration here will not be inopportune in connexion with the matter referred to above.

At the outset it must be borne in mind that the effect of a tropical climate on the seed of temperate plants is injurious to their vitality. Only freshly imported seed, therefore, may be expected to germinate satisfactorily. Even the seed of the onion, which is a sub-tropical plant, will not retain its vitality for more than a few months. It has been actually found that seed of this plant, if kept in air-tight bottles, will retain its power of germination for six months, but after that there is a rapid deterioration. An example of rapid deterioration is recorded in connexion with some Scarlet Runner seed that was known to have been of high quality, but which lost its germinating powers under tropical conditions in a few weeks. It is therefore necessary to purchase only freshly imported vegetable seed.

Apart from temperate vegetable seed, many of our tropical seeds lose their vitality very quickly. A notable instance is that of Para rubber seeds, which when distributed have to be specially packed in damp charcoal to keep them alive. Seeds of the Bay tree also very quickly lose their vitality, and when raising Bay seedlings the seed should be sown immediately it is taken from the berries. On the other hand, there are many plants the seeds of which are well adapted to retain their vitality for enormous periods. These are usually the hard-coated seeds, of which the tropical leguminosae furnish examples. Some striking cases of slow germination include seeds which remain in the soil for many years before the outer coats decay sufficiently to admit water and allow germination to begin. In such cases the use of a file or a short immersion in sulphuric acid will accelerate matters.

As most people know, the germination capacity of seeds can easily be tested by counting out a certain number and keeping them on damp blotting paper, care being taken to allow the presence of fresh air. There are one or two aspects of this apparently simple test that require careful consideration, however. It is necessary first of all to distinguish between germination capacity and rate of germination. One may have a hundred seeds all of which will have germinated uniformly in three days, while the germination of another hundred of the same kind may be spread over a week. The first sample will obviously give a more uniform and an earlier crop of seedlings than the second. Yet the ultimate germination capacity of each is the same.

Some onion seed which had been kept in cold storage for a year was recently tested by this Department with interesting results. The method adopted was not the orthodox one of taking one lot of a hundred; three lots of a hundred each were counted, and these divided into groups of ten.

The following were the results:—

In first groups of ten,	In second groups of ten,	In third groups of ten,
2 germinated.	2 germinated.	3 germinated.
3 „	3 „	3 „
3 „	5 „	3 „
4 „	2 „	1 „
5 „	3 „	3 „
5 „	6 „	2 „
6 „	6 „	4 „
6 „	2 „	2 „
6 „	7 „	2 „
8 „	6 „	5 „
48 per cent.	42 per cent.	28 per cent.

It will be seen that the germination was very uneven, and that the percentage germination figure is absolutely unreliable. That this is so can be seen by examining the figures in the first column, where there is an extreme range of from 2 to 8. As a matter of fact the second two experiments were merely conducted as confirmatory tests of the inference that the 48 per cent. is undependable. The point to be emphasized is, that taking one group of a hundred out of a considerable quantity of seed is not sufficient to give reliable results. It is the same principle that holds good in the case of manurial and other plot experiments: duplication is necessary as a means of exposing the degree of variation. It must be pointed out, however, that the percentage figure for germination becomes more and more dependable the nearer it approaches 100, and conversely, the nearer it approaches 0. So that a germination percentage of, say, 95 may be accepted as being practically reliable.

Good onion seed has a germination of between 90 and 99 per cent. Cotton has a germination of 80 to 90 per. cent. But where so-called 'bad germination' occurs, it is by no means always the fault of the seed.

In the West Indies, small seed like that of most vegetables is frequently carried away by ants. This was probably the cause of the failure referred to by our correspondent. In gardening work the visits of ants may be frustrated by placing the seed boxes on a bench the legs of which rest in small receptacles containing water. In the garden itself the most satisfactory method is to locate the nests, and kill the colony by application of carbon bisulphide. Birds may also be responsible for the loss of planted seed. This menace can be circumvented by employing wire netting.

Another factor which may interfere with germination is a badly regulated water-supply. Too much water is as bad as too little. Though not strictly connected with the actual process of germination, it may be noted that 'damping off' of seedlings is closely related to excessive moisture conditions and overcrowding. Lastly, seeds should not be planted too deeply, and should be sown only in well tilled soil in fine condition. This latter remark applies to the field cultivation of cotton. Cases are known where coarse pen manure applied to the land too soon before planting has led to bad germination resulting in an uneven crop of cotton, and consequently an unsatisfactory one.

SUGAR INDUSTRY.

SUGAR-CANE EXPERIMENTS IN BRITISH GUIANA.

A compressed account of the results of important experiments conducted in connexion with sugar-cane in British Guiana by the Department of Science and Agriculture during 1914-15 appears in a recently issued Department Report.

In this it is stated that work in connexion with the raising of seedlings of sugar-cane was continued. In all 9,730 seedlings were raised, and of these 3,510 have been retained at the Botanic Gardens and 1,517 distributed to sugar estates in the Colony. Of the seedlings retained at the Botanic Gardens, 1,486 were possible crosses, while 315 were selfs. A list is given of the more important varieties crossed.

The general crop returns in the experiments were not very satisfactory due in part to the defective rainfall, but more largely to the long period the various fields have been under sugar-cane cultivation without rest. Nevertheless the accumulated results obtained are significant and of great interest.

In regard to manurial experiments with sulphate of ammonia and nitrate of soda, the figures show, as usual, that these forms of nitrogen produce important increases of something like 6 tons per acre.

The mean annual yields during the four crops 1910-13, presumably due to applications of 60lb. of nitrogen in each of the manurial applications, were: sulphate of ammonia, 9·4 tons of cane increase per acre; nitrate of lime, 6·7; nitrolim, 5·8; nitrate of soda, 3·1 These increases are from three to six times the probable error, which is indicative of their significance.

The report then goes on to describe the effect of manuring on the soil. It is of interest to note that the North-east field does not contain any lime in the form of calcium carbonate, and the calcium oxide dissolved by the citric acid used in determining the available constituents must have been derived from calcium phosphate, calcium silicate, or the traces of calcium sulphate in the soil.

In regard to the significance of physical analyses in which the relative amounts of different particles are determined, the report shows an interesting application of 'probable error' principles. It is stated that it is usual to reduce the probable errors within reasonable limits, say, one-half of 1 per cent. for each constituent other than clay, on which being determined by difference the cumulative errors fall. For this purpose to obtain a reliable sample of the soil of an absolutely flat, apparently uniform 5-acre field, the sample must be drawn from at least nine different plots scattered over the field, and preferably from sixteen. From each plot the sample must be drawn, as the samples were in the investigation described in the report, from at least five places, and a sample representative of the soil of the plot prepared by mixing them together.

In connexion with the importance of nitrogen and humus in the soil, it is stated that the nitrogen of the humus portion of the organic matter does not influence the yield: it appears to be inert. The yield of the plots is clearly shown to be due to the proportions of available nitrogen present therein, or rather during the active growth of the crop. It was not possible to trace any relationship in the yields of the plots to their relative contents of either so-called available calcium oxide, potassium oxide or phosphoric anhydride; but the long-continued field trials in British Guiana have shown that soils containing more than ·005 per cent. of either potassium oxide or phosphoric anhydride soluble in 1 per cent. citric acid solution do not respond to manuring with these substances, so that the results of the present year are consistent with experience. It is thought, however, that this may not apply to soils in places like Barbados, where the rainfall is less, and the soil lighter in texture.

During the year it became possible for the first time to compare the sugar content of a considerable number of hybrid varieties of cane with that of their parent cane. The figures given appear to indicate increased variation and vigour in the progeny, often accompanied by improved sugar contents.

An interesting piece of work described in the report has reference to an examination of new seedlings of the Bourbon strain. It has been found that the tendency is for varieties derived from the Bourbon to be relatively low in sucrose, yielding juice having a low quotient of purity and a high one of non-sugars. Few only of the Bourbon derivatives are characterized by a high or even a medium sugar content.

With reference to the different varieties under cultivation in British Guiana, the figures indicate that a large increase occurred in the case of D. 625. The Bourbon cane is rapidly going out of cultivation.

THE OIL OF THE GROUND NUT.

In a recent publication issued by the Egyptian Ministry of Agriculture, the Director General deals very fully with the subject of ground nuts. The following information in regard to the commercial uses of ground-nut oil is of particular interest, since this side of the subject is not usually discussed at any length in an agricultural treatment of this crop:—

The freshness of the nuts used in oil extraction is indicated by the colour of the oil which results. After keeping the nuts for some time, a colouring matter, which is present in the nut, diffuses itself into the oil cells and renders the oil dark in colour instead of pale straw colour. M. Fleury, in a work on the subject referred to by M. Adams, says that by long exposure to sunlight the oil bleaches completely. Some varieties of ground nuts give an oil of deeper colour than others; those from La Plata, Congo, and Mozambique are said to be the palest; those from Spain and Senegal slightly darker; while those from Gambia and Sierra Leone, as well as from India, yield the darkest coloured oil. No comparisons seem to be recorded in this matter with regard to Egyptian ground-nut oil.

M. Fleury mentions that on exposure to the air for some months the oil absorbs a certain amount of oxygen, and becomes slightly resinous. This absorption is accelerated by the addition of heat.

Ground-nut oil contains a little more margarine than olive oil, yet the fluidity of both is the same. It begins to form a quantity of margarine at 8°; at 6° it congeals completely, and at 3° it becomes a solid mass which does not acquire greater consistency The oils from some varieties congeal more rapidly than others.

As a lubricant, ground-nut oil is slightly inferior to olive oil, but as a luminant it is said to be superior.

Ground-nut oil of the first expression is often a strong competitor with olive oil as food, and is frequently used for mixing with the latter oil. The most important use, however, is for the manufacture of oleomargarine butter, into which enters about 50 per cent. of milk combined with from 20 to 30 per cent. of oil from Cayor Rufisque (Senegal) nuts, which possess the special flavour required.

The soaps made from ground-nut oil are excellent, and are largely employed in washing silk and wool. The oil of the third expression is that which is used in the manufacture of soap; those of the two cold expressions being used almost entirely as comestibles. A small quantity of oil is said to have been used for soap making in Egypt at the factory of Arbib, near Zagazig, but this has recently ceased to work (*vide* Mr. Cartwright).

The cake is employed both as a cattle food and as a fertilizer, but the cleaned and decorticated cake is only used for the first named purpose. Ground nuts from Southern India are, by reason of their dark colour, less in demand than those from other localities, for which reason they are not skinned before expressing their oil, and the rough cake which is produced from them is employed as manure. The analyses made by M. Fleury, from cake resulting from Rufisque nuts, showed about 8 per cent. of nitrogen, and about $1\frac{1}{2}$ per cent of phosphoric acid. As a manure, the cake is considered as of great value.

It is unfortunately not possible at the present time to give any special analyses of Egyptian ground nuts.

It may, however, be accepted that the Egyptian product could be used in the same manner as the Gambian or second-quality Senegal qualities.

ORCHARD CULTIVATION.

THE BAY TREE AS A CROP PLANT.

In the last issue but one of the *Agricultural News* appeared a summary of the first half of a paper in the current issue of the *West Indian Bulletin*, on bay oil and the cultivation of the bay tree as a crop plant. The summary referred to dealt principally with the method of establishing a plantation of bay trees and with the composition of bay oil. The Bulletin article referred to, concludes with an account of the results obtained from experiments connected with the distillation of the oil from the leaves.

Monthly reapings of leaves from the experimental area in Montserrat were distilled separately, and the resulting oil examined. This work was conducted over a period of three years. A survey of the results shows the relatively greater variation which occurs in the composition of the oil from the trees on the plot, while the yield of oil per 100lb. of leaves is also found to vary within wide limits. No very close connexion was observable between the yield of oil and the season of the year at which the distillations are conducted, nor is the connexion between the season of the year at which the distillations are performed and the composition of the resulting oil particularly obvious, although there is some indication that leaves reaped between the months of March and August give oils with a higher phenol content than do those at most other seasons of the year. This may perhaps be interpreted as indicating that the best results are obtained in the dry seasons of the year. Distillations conducted during the year 1915, and not included in these results, further strongly confirm this idea.

It is to be remarked that the yield of oil per 100lb. of leaves shows a progressive increase as each year elapses, and the inference seems to be that the oil content of the leaves tends to get greater as the trees approach maturity, although the result in question is partly due to increased care in reaping, which has insured that none but mature leaves are gathered.

As the outcome of the above results, the question arose as to whether much variation is experienced in the yield and quality in the oil obtained from individual trees. An investigation indicated that considerable variation both in yield and composition occurs in the case of individual trees, and it would appear that the selection of trees for obtaining seed for planting purposes on the basis of a satisfactory yield of oil of good quality is likely to be productive of good results.

Another point which was made the subject of investigation was the progressive variation of the composition of the resulting oil as the act of distillation proceeds, combined with an attempt to ascertain the length of time for which it is profitable to continue distilling. It was found that the volume of the oil distilled per hour diminishes rapidly after the first hour; of the total amount collected, about half comes over during that period, the remaining fraction gradually diminishing in volume until the ninth hour is reached. An important result arrived at was that the phenol content increases up to the eighth hour. Formerly it was customary in the Montserrat experiments to stop the distillation at the end of the sixth hour, but in view of the fact that the value of bay oil depends largely upon its phenol content, it is important to ascertain what the effect on the phenol content is of the small amount of oil distilling over in the last three hours not included hitherto. It was found that when the first to the sixth fractions are mixed, the resulting mixture has a phenol content of 54 per cent.; while when the seventh and eighth fractions are included, the mixture shows a phenol content of 58 per cent.

Other points dealt with in the paper referred to, include the desirability of using sea-water in the still in the place of fresh water; the keeping qualities of bay oil; and lastly the action of bay oil on the metal of the still. It was found that there is no advantage in using salt-water, although it is favoured in St. Thomas and St. Jan. As regards keeping qualities, the oil will keep unchanged as regards phenol content for upwards of three years, but polymerization of the myrcene occurs, producing waxy solids or heavy oily liquids. In regard to the effect of the oil on metal, it was found that lead must never be used, and that the best metal is copper.

NOTES ON COCO-NUTS IN DIFFERENT COUNTRIES.

These notes appear in the current issue of the *Bulletin of the Imperial Institute* (Vol. XIV, No. 1), and give a good idea of recent progress in coco-nut cultivation in different parts of the tropics:—

At Batticaloa, the centre of the coco-nut cultivation in the Eastern Province of Ceylon, the average annual rainfall is nearly 63 inches, but 50 inches of this falls during the North-east monsoon from October to February; owing to this uneven distribution of the rainfall the palms only bear small crops (*Tropical Agriculturist*, 1914, 45, 293). The trees are planted eighty to an acre, and bear, on an average, twenty-five nuts per tree a year; it is suggested that conservation of soil moisture by removal of weeds and disc-harrowing once a month would increase the yield. The soil is sandy and suitable for coco-nuts, although lacking in humus. The waste husks should be returned to the soil instead of being burned, and jungle mulch should be applied wherever this is easily obtainable. Green manures are recommended for young plantations, divi-divi being particularly suitable.

Coco-nut planting has made good progress in the Gold Coast Colony, but at present copra is produced almost exclusively in the Quittah and Addah districts of the Eastern Province (*Rep. Agric. Dept.*, Gold Coast, 1914, pp. 10, 16).

Coco-nuts planted at the Assuansti Experiment Station in the Central Province are making very satisfactory growth, and palms planted in 1910 flowered in 1914. Rhinoceros beetles have been troublesome on the plantation, but no trees have been destroyed.

In Brazil coco-nut palms are frequently attacked by a bacterial disease similar to that which has been ascribed to *Bacillus coli*, and some trees have been destroyed (*Boletin da Agriculture*, Sao Paulo, 1915, No. 5, p. 435). It appears that certain insects cause damage which aids in the spread of the disease, and of these *Amerrhinus pantherinus* is the most important; the larvae excavate galleries in the leaf petioles, thus causing the death of the leaves: destruction of the parts attacked is the only remedy. The larvae of *Alurnus marginatus*, Guer., also attack the leaves: spraying with insecticides has been found useful for the control of this pest.

The larvae of a moth (*Castnia daedalus*) were reported a few years ago as causing damage to coco-nut palms in British Guiana (cf. this Bulletin, 1914, 12, 305). The insect has since been found to be very abundant in some districts, and according to the Government Economic Biologist, it is the worst pest which has hitherto attacked the coco-nut palm in the colony, and it is considered that, unless its ravages are checked, coco-nut cultivation will cease to be profitable (*Rep. Dept. Sci. and Agric.*, British Guiana, 1913-14, App. III, p. 7). The enactment of a Plant Protection Ordinance is regarded as desirable for the purpose of eradicating this and other pests.

CO-OPERATIVE INSURANCE OF LIVE STOCK.

In the *Agricultural News* for October 9, 1915 (Vol. XIV, p. 324) appeared an article suggesting that a co-operative agricultural insurance society should be formed in Antigua. In connexion with this, the following extract relating to co-operative insurance in India and Ceylon, taken from the *Tropical Agriculturist* for March 1916, will be of interest:—

In some countries cattle insurance is a compulsory measure and State-aided, or the State assists in the formation of a central organization to which local societies are affiliated. A proportion of the premium received by the local societies goes to the central body, which shares the indemnities in the same proportion. In this way risk is diffused and a large area covered.

It is desirable that societies should cover only a limited number of villages.

Very young stock or old cattle should not be accepted for insurance. The age should range from two or three to twelve years. Sickly animals should also be excluded. The cattle should bear the brand mark of the society.

A member may join the society by paying an entrance fee and afterwards pay the premium. He may insure all his healthy cattle. In admitting cattle the maximum value of the animal should be fixed. Valuation may be checked by a committee appointed for the purpose. This committee may include the Government Veterinary Surgeon or his Assistant and two or more members of the society. Their valuation should be final. As the animal grows, the valuation may be checked annually or half-yearly, and premiums adjusted accordingly.

The rate of premium may be fixed in accordance with the risks involved. In some countries epizootic diseases are excluded from the risks; but in Ceylon there is likely to be no inducement unless such diseases are included, and this is an important point for consideration. Sufficient care should be taken to exclude areas which are hotbeds of rinderpest, or to begin with, let aparticular class of animals, say, plough and draught cattle, be dealt with. These animals receive more care at the hands of owners than others.

Where ordinary epizootic diseases are included, the premium rate in Burma is 3 per cent. per annum per head, but this is increased to 6 per cent., if rinderpest is included. The whole value of the animal may be paid as compensation, or a certain percentage of the value. No indemnity is paid for an insured animal if that animal dies within a certain period. Generally this period is taken as fifteen days, which is the incubation period. After receiving an indemnity the member must continue to remain so for a certain period. No indemnity is paid to an owner whose cattle are insured, where damage is done by a third party who is liable to pay compensation. When a death occurs the valuation committee must view the carcase of the animal and give the necessary certificate. When an insured animal is sold to an outsider the member may put in its place another animal, which after the decision of the valuation committee may be registered in the books of the society. No compensation shall be paid when the damage is due to the neglect of the owner, if such neglect is proved at an enquiry held by the committee. The owner should observe the by-laws of the society and should take proper care of the animals. He should forthwith report any ailments of the animal to the Secretary who should take proper steps to inform the nearest Government Veterinary Surgeon or his assistant. In this way greater attention is paid to the care of the animals, the dissemination of disease is controlled, and cattle straying reduced to a minimum. The Managing Committee should supervise the work of other Committees, make such sanitary regulations as appear necessary, and see that insured cattle are well looked after by the owners. Any breach of a by-law may lead to the loss of a claim on the society.

State-aid is to be expected if a satisfactory scheme is put forward. This will ease the hands of the societies on the financial side.

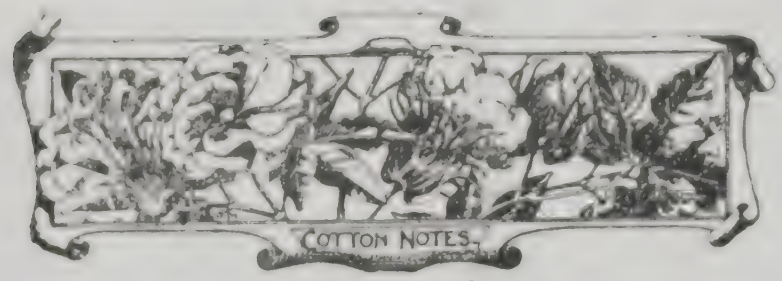
The Composition of Cassava Roots.—An article of some interest, by the Chemist to the Central Experiment Station, Santiago de las Vegas, appears in *Modern Cuba* for April 1916. This contains a table of analyses of a large number of varieties of cassava grown in different parts of the world. It is stated that the most important constituents of the cassava roots are the carbohydrates (starch and sugars) and a cyanophoric glucoside, Linamarin. The starch content is shown to vary from as low as 11 per cent. in the poorer sorts to 35 per cent. or more in the best. The hydrocyanic acid content varies considerably both in amount and distribution in the plant. A few years ago it was believed that there are two distinct species of cassava differentiated by their hydrocyanic acid content, and by certain peculiarities in leaf form whence the names 'bitter cassava' and 'sweet cassava'. It is now generally held that the different sorts of cassava are all varieties of one species.

Figures of analyses in this article show that with the exception of those from Jamaica, the different authorities give nearly the same figures for the average starch content of cassava roots. The high starch content reported from Jamaica is regarded as indicating that especially favourable conditions prevailed there, or that especially fine strains have been developed. Probably the favourable composition is influenced by both factors. The percentage of ash found in Cuba is lower than that reported from other parts of the world, while that obtained in the Philippines is very much higher. The table makes it clear that the feeding value of cassava roots is governed by the starch content, the protein and fat content being very low.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Tuesday, July 11, 1916, by the C.R.M.S. 'Chignecto', after paying an official visit to St. Lucia extending over two weeks.

By the S. S. 'Guiana', which sailed on July 7, Mr. H. A. Ballou, M.Sc., Entomologist to this Department, departed *en route* for Egypt, where he has been seconded to the Egyptian Government for one year, for the purpose of advising on entomological matters connected with the production of cotton in Egypt.



COTTON CONFERENCE.

FIFTH DAY'S PROCEEDINGS AND CONCLUSION.

FURTHER DISCUSSION ON PESTS AND DISEASES.

Some discussion followed between Mr. S. C. Harland (St. Vincent) and Mr. W. Nowell (Imperial Department of Agriculture) in connexion with selection of cotton for resistance to disease. Mr. Nowell pointed out that there was a greater chance of succeeding, if the selection were done with special reference to a specific disease than in respect of diseases in general. Mr. S. C. Harland called attention to the fact that in the selection, unless resistance was shown in the next generation there was no use going any further.

In bringing the discussion on pests and diseases to an end, the President in the course of some remarks called attention to the need for an institute of research in relation to the science of agriculture in the West Indies.

The subject then brought up for discussion was whether cotton bushes should be destroyed by burning or burying. Mr. F. R. Shepherd read a few notes on the subject in which he advocated the burying of cotton, provided certain precautions are taken. Dr. H. A. Tempany (Leeward Islands) said that from a manurial point of view, burying was open to objection only on poorly aerated soil.

The Montserrat delegates thought that the destruction of cotton bush should be made compulsory. They appeared to be of the opinion that as long as it was done thoroughly, it mattered not whether bush was burned or buried.

Mr. H. A. Ballou and Mr. W. Nowell said a few words to show that it is not likely that any insects or diseases of importance would be carried over by burying cotton bush in the soil.

Turning to another subject, the President asked Mr. T. Jackson (Antigua) to read a note on hybrid cotton. In the course of this it was learnt that this cotton was a special type for cultivation on clay lands in Antigua, where ordinary Sea Island cotton did not thrive; it was useful in enabling planters to rotate cotton with cane.

Mr. Harland was asked to give an account of the work he had done in regard to the budding of cotton. In the course of some remarks he said that he had obtained success, and that it was possible when one has a particular quality and a pure strain and wants to continue it, one can do so by budding.

After a few speeches of a general nature by His Honour the Administrator of St. Kitts, Dr. Watts (the President) and others, the Conference was brought to a close.

The next day, Saturday, March 18, a special session of official experiment station workers was held with the object of discussing measures that should be adopted in the selection of seed.

For an account of the various systems the reader is referred to the report of the first and second days' proceedings of the Conference. During the present session, it was decided that the scheme of selection work in the different islands should remain practically the same. In regard to Antigua, however, it was suggested that seed should be interchanged between Yepton seed farm and a station on the windward coast, with a view to deciding whether the effect of environment was really so pronounced as to render the extra trouble and expense of a second seed station necessary. It was also suggested that in the examination of type, Balls's Target method should be employed as the best means of determining the purity of strain.

PRODUCTION OF SELECTED STRAINS.

The progeny row method, which received much consideration in previous discussions, was generally recognized as the only satisfactory way of selecting cotton. In regard to the West Indies, it was decided that the best process to follow was that given below:—

First year. Progeny rows.
Self a convenient numbers of plants for continuation of series.
Examine each plant in each progeny row for trueness to type
Obtain Spinners' and Brokers' opinion of cotton from each progeny row.

Second year. Plant plots from one or two best progeny rows to form seed plot for commercial planting next year
Select seed for starting new progeny rows and repeat work as in first year.

Third year. Large scale planting (commercial) from last year's seed plot.
Continuation of work as in first and second years.

It was further suggested that productivity should be judged (a) by number of flowers and (b) by weight of lint, while the general habit of the plants in each experiment plot should be recorded.

LABORATORY METHODS.

In connexion with the discussion on the laboratory work, Mr. Harland demonstrated the method used by him of determining mean maximum length by measuring lint on squared paper.

As regards the measurement of lint length, it was stated that in the Leeward Islands the mean length of available fibre is generally adopted, while in St. Vincent the mean length of the longest fibres was taken. It was thought that Balls's method whereby the mean maximum length was determined was perhaps not generally suitable for West Indian cotton on account of there being, in all probability, much greater range of lint length than there was in Egyptian cotton. The method of measuring lint pulled from the seed should not be hastily discarded

The general result of the discussion was, that it is regarded as essential that each worker should state precisely in his report what method of laboratory working he adopts.

The following factors should be recorded:—

Lint Index. The total weight from 100 seeds—This should be estimated on something over 100 seeds and calculated to the 100.

Available Fibre. All fibre measuring 37 millimetres and over is to be reckoned as available fibre. This is to be determined on ten seeds, and recorded as a percentage on the weight of the seed-cotton.

Ginning Outturn, i.e., weight of lint per 100 parts by weight of seed-cotton, should also be recorded.

Some discussion took place during this session concerning the value of score cards for cotton field-selection used in the Leeward Islands.

It was agreed that selection in regard to resistance to disease requires to be more definite and have relation to one disease at a time rather than diseases in general. It was agreed also, in connexion with field selection, that experiment station workers should carefully record observations dealing with the general habit of the plants. This applies to manurial and planting experiments with cotton, as well as to work in seed selection.

CONFERENCE DINNER.

The visiting delegates of the Conference entertained at dinner, at Old Government House, on the evening of Friday, March 17, the resident delegates and the principal Government officials of the Presidency of St. Kitts-Nevis. The President of the Conference (Hon. Dr. Francis Watts, C.M.G.) occupied the chair. Covers were laid for thirty-five.

Among the guests were His Honour Major J. A. Burdon, C.M.G., Administrator of St. Kitts-Nevis, and Hon. T. E. Fell, Colonial Secretary, Barbados.

A summary of the speeches is included in the Conference number of the *West Indian Bulletin*, just issued

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and forty-eighth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, June 6. In the absence of the President (The Right Hon. the Earl of Derby, K.G.), Mr. J. Arthur Hutton occupied the Chair.

A resolution was passed expressing the deep sorrow of the Council at the lamentable death of Lord Kitchener, and their regret at the irreparable loss sustained by the nation and the whole of the British Empire. In moving the resolution the Chairman drew special attention to the great debt which the Association owed to Lord Kitchener. He always took the deepest interest in all matters concerning the welfare of the Empire, and more particularly in the development of the Anglo-Egyptian Sudan. Lord Kitchener had himself carefully studied all the details of the scheme for growing cotton in the Gezireh Plain, and it was largely due to his representations that the Government decided to assist the Sudan Government in raising the necessary capital. One of the last acts of Lord Kitchener in connexion with this great scheme was drawing up an arrangement which would ensure that the native farmer should not be left at the mercy of the capitalist, but should receive a fair reward for his labours.

The Chairman felt that one of the best and most enduring monuments they could raise to the memory of Lord Kitchener was to use their best efforts in making a success of the Gezireh Scheme, and so to bring prosperity to the inhabitants of the country in which Lord Kitchener took the deepest interest, and from which he took his title.

WEST AFRICA. The purchases of cotton in Lagos to May 27 amounted to 7,845 bales as compared with 3,332 bales for the corresponding period of last year, and 12,031 bales for 1914. The purchases in Northern Nigeria to May 27, amounted to 10,066 bales against 333 bales for the corresponding period of last year, and the previous maximum of 2,135 bales in 1912. The Lieut. Governor and the Resident recently paid a visit to the Association's Ginnery at Zaria, and were astonished at the quantity of cotton which had been purchased. Cotton is coming in by camel from Katsena and Sokoto, which is a gratifying feature as showing the distance the natives are prepared to bring the cotton, and also proving that the possibilities of cotton growing as an export trade are being realized by the native producers.

A communication has been sent to the Government in regard to the extraordinary developments in Northern Nigeria, with a view to obtaining the best information which can be got in reference to the future prospects of the industry.

It is understood that Sir F. Lugard, the Governor of Nigeria, will be on leave sometime this month, and as soon as possible after his arrival an interview will be arranged with him. Meantime a letter has been received from the Director of Agriculture for Northern Nigeria, wherein he alludes to the large quantities of cotton purchased by the Association this season, and to the outlook for much larger quantities next year.

A very fine coal field has been discovered in Southern Nigeria, the seam being about 4 feet deep; the coal is superior in quality to South African coal, and it is only necessary to cut into the face of the hill to get the coal. This coal will soon be available for use on the Lagos railways, and it is considered to be a most valuable economic discovery for West Africa.

SUDAN. Reports from the Sudan were read, stating that the climatic conditions which were unfavourable are now rather better, and an average yield is expected of from $3\frac{1}{2}$ to 4 kantars per feddan.

NYASALAND. It was reported that since June last year shipments of cotton had come forward from Nyasaland in a very satisfactory manner, 4,016 bales having been shipped to the Association.

Report from Mr. McCall, the Director of Agriculture, was read stating that the output of cotton in Nyasaland for 1915 amounted to 8,026 bales.

UGANDA The Director of Agriculture for Uganda reports that the exports of cotton from that Protectorate for the year 1915 amounted to 24,530 bales.

Statement was submitted showing that the Association had sold 35,013 bales during the month.

An allotment of twenty-nine shares was made, bringing the total amount of capital allotted to date £468,264.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool write as follows, under date June 12, 1916, with reference to the sales of West Indian Sea Island cotton:—

A good business has been done in West Indian Sea Island cotton since our last report, and over 400 bales have been sold at prices varying chiefly between 17*d.* and 20*d.* The sales are principally confined to Montserrat, St. Kitts, Barbados, and Nevis. Prices are dearer and quotations are raised 1*d.* per lb. The better prices obtained are owing to the rapid advance of Sakellarides Egyptian, the entire stock of the better grades of the latter having been quite swept off the market. Prices of Sakell have recently advanced from 16*d.* to $18\frac{1}{2}$*d.*, and new crop is being purchased for winter months at 15*d.* for the best.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the various reasons why unsatisfactory germination results are sometimes experienced with seeds in the tropics.

On page 228 will be found a continuation from the last issue but one of this Journal, of the article on the Bay tree as a crop plant.

The concluding section of the report on the Cotton Conference held last March at St. Kitts, will be found on page 230.

A review of an interesting book on sub-tropical vegetable gardening will be found on page 237.

Plant Diseases in this issue (see page 238) concern Pink Disease in the West Indies.

The Demand for Sponges.

The American Consul at Hong Kong has drawn attention, in a recent Report, to the fact that the present supply of sponges to that port comes from Great Britain, although their origin is Turkey. These sponges are chemically bleached, and it is stated that they rot quickly and that their sale is limited for that reason. The American Consul urges that the United States should enter the Hong Kong market with Florida and Bahamas sheepwools. As to whether the sponges actually originate from Turkey, as stated in the Report, is open to doubt; but if they do, action ought to be taken to substitute British or else neutral produce in supplying Hong Kong or any other British possession.

There is but little doubt that sponge cultivation could be developed extensively enough in parts of the British tropics and sub-tropics to supply at least a considerable portion of the number required within the Empire, and in this connexion reference may be made to an article in the *West Indian Bulletin*, Vol. XIV, No. 2, dealing with the subject of sponge growing by means of cuttings. The subject from a West Indian stand-point is receiving attention, as noted in the *Agricultural News* for June 17, 1916 (Vol. XV, p. 205).

The Measurement of Tilth.

In a previous issue of this Volume of the *Agricultural News* (No. 360, p. 49) attention was drawn editorially to the advantage of the production and maintenance of a good tilth in soils and, as a consequence, of the ability to compare the tilth of different soils by physical measurements; and it was suggested that the most likely way of obtaining a useful index of tilth is by means of an appliance described by C. A. LE Clair in the *Journal of Agricultural Research*, Vol. V, No. 10 (Device for Testing the Compactness of the Soil). An illustration of this appliance was given on page 50 of the issue of the *Agricultural News* referred to above, as also a description of its construction and manipulation.

The *International Sugar Journal* for May 1916, reproduces substantially our views on this matter, and emphasizes the desirability of making trials of such an instrument on experiment stations and large estates with a view to elucidating the many points that might arise, and which should be settled before the instrument could be standardized and made to serve any useful purpose in agriculture. One point, for example, suggested by the Journal is this: that in stony soils it would be no easy task to eliminate obstacles to the passage of the spike. But this, and other points brought forward, ought not to be beyond the powers of any keen agricultural experimentist, and data for using this instrument in specific branches of agriculture would, when fixed on, serve a not unimportant scientific rôle.

It might be mentioned here, that this Department is having one of these devices made, and experiments with the object above stated will be conducted in due course.

The Spread of Agricultural Credit Societies.

According to the *Dominica Chronicle* for June 24, t would appear that the Government of that Presidency s endeavouring to foster the establishment of agricul-ural credit societies among the peasant proprietors n the various country districts, such as exist already n St. Vincent, Trinidad, and St. Lucia. It is understood hat the Government is prepared to offer financial ssistance on the understanding that the money is pplied to productive purposes. It is stated that the Assistant Curator has toured the island in order to gain loser personal contact with the small cultivators whose needs these societies are to meet, and to explain o them the working of the scheme and the benefits hey may derive from it.

The above indicates a further spread of a useful novement that originated in St. Vincent. The adop-ion of the scheme last year in Trinidad was another opeful feature of the movement, and it would appear hat good progress is being made in Trinidad. In recent issue of the *Port-of-Spain Gazette*, a notice ppears to the effect that the Director of Agriculture who is also Registrar of the Credit Societies) has ppointed, under the Act, Mr. W. G. Freeman, Assist-nt Director, to be Inspector of the Agricultural Credit Societies in that Colony. The effect should e to stimulate the movement.

Thymol Production in the West Indies and Florida.

The Imperial Department of Agriculture for the West Indies is again responsible for starting what may possibly develop into a minor industry in these islands. This statement has reference to the introduction of *Carum copticum* (Ajowan) seed, the plants of which yield the well-known antiseptic thymol. The plant has grown well at several of the Botanic Stations, and if the oil can be satisfactorily distilled (and there is no reason to think that this cannot be done), it is possible that the cultivation of this plant in certain districts might pay.

The object of this note, however, is to call atten-ion to an effort that is being made in Florida to pro-uce thymol commercially from horse-mint (*Monarda punctata*). A Bulletin (No. 372) contributed from he Bureau of Plant Industry, United States Depart-ment of Agriculture, states that the annual consumption of thymol in the United States is sufficiently great o warrant a small industry for its production when carried on in connexion with the distillation of other volatile oils. This is exactly the position in the West Indies. If the stills used for bay oil, lime juice or rum could be made use of when unemployed for their principal function, Ajowan oil could be profitably produced. Figures are not available as to the return per acre to be expected from Ajowan cultivation in the West Indies, but it is estimated in Florida that after the first year the Monarda crop would give a gross return of about $40. The cost of production would of course be cheaper in the West Indies than in the Southern States.

Agricultural Conditions in Honduras.

It is stated in *The Board of Trade Journal* that there has been a gradual increase in agriculture, especially on the north coast, where the banana industry is continually expanding. Tobacco continued to be the chief source of income to Copan, and was cultivated to a considerable extent in other Departments. The high prices recently obtained for indigo in foreign markets stimulated producers in Honduras, who are now cultivating indigo in the Departments along the border between Honduras and Salvador. Good harvests of maize, sorghum, beans, rice and cassava, wheat, coffee, potatoes, etc. have been reported from various parts of the country. It is stated that the means taken to cope with the locust pest, which caused great injury to the crops, have proved successful.

There has recently been considerable railway development in Honduras, and this has resulted in the extension of agricultural industries.

Exaggerated Statements Concerning Bacterized Peat.

The discovery by Professor Bottomley of bacterized peat has aroused a considerable amount of attention during the last two years, chiefly on account of the statements that have been put forward concerning the revolutionary effect it was expected to have upon British farming.

While bacterized peat does undoubtedly possess some power of stimulating plant growth, its useful value in the field has not yet been established. Hence such statements as 'the discovery has made it possible to double the production of our food supply' in regard to Great Britain are completely unjustified, and have been responsible recently for a strong critical statement of the matter by certain authorities, namely, the Secretary of the English Board of Agriculture, Professor T. P. Wood; and Professor R. H. Biffen, of Cambridge. In some correspondence in *Science Progress* (No. 40, April 1916) it is clearly shown that there is no foundation for saying that bacterized peat has any practical manurial or stimulating value in the field.

In another publication (the *Agricultural Gazette of Canada*, for May 1916) an article on the same subject appears, describing an attempt made to produce bacterized peat at Macdonald College. Confirmation of the results stated to have been obtained by Professor Bottomley, the inventor, was rendered impossible by Professor Bottomley refusing to give any adequate information as to the methods he adopts. The Canadian work has indicated, however, the difficulties and intricacies of the problems involved, and it is believed that the whole problem of bacterized peat is in an experimental stage. While one may be be inclined to the opinion that there may be possibilities in the use of peat or some derivatives of peat as a fertilizer, the only wise plan is to wait for further data and confirmatory results both from the laboratory and from field trials.

THE PRODUCTION OF CLEAN CONCENTRATED LIME JUICE.

Mr. A. S. Burleigh, of Dominica, has forwarded through the Agricultural Superintendent and Curator at Dominica, the following note on the production of clean concentrated lime juice by the open-tayche method. While the concentration of juice by means of steam coils is to be advocated, the following shows nevertheless what can be accomplished by exercising care in conducting concentration by the cruder method. In juices prepared in the following manner the sediment has not been found to amount to over 30 units, and in one case examined it was nil. A juice containing not more than 30 units could almost be guaranteed. In the ordinary way Dominica juices give a sediment test of 100 to 120 units, and in some cases it goes up to 150. It is of interest to compare these figures with the average sediment figure for concentrated juice prepared by steam coil heating at the Government Lime Juice Factory in St. Lucia, which amounts to only 2·5 units.* Mr. Burleigh's results, therefore, indicate that great care must have been taken in their achievement:—

In order to produce clean concentrated juice, it is highly important that the raw juice should be reasonably free from matter in suspension. It is impossible to turn out a high degree juice from material containing pulp and sludge.

To this end the juice should be allowed to settle in the vats. The pulp will then rise to the top and the sludge is precipitated. The vat should be provided with two taps; one about a foot from the bottom for drawing off the clear juice, the other in the bottom for running off the settlings. The position of the clear juice tap will vary somewhat according to size of vat and degree of extraction obtained from the mill. A foot is about right for an 800-gallon vat with good extraction.

In order to catch any stray pulp which may be drawn out with the clear juice, it is advantageous to run it through some straining cloth on its way to the tayches, ordinary cheese-cloth answering the purpose very well.

During the process of concentration the main points to be observed are: frequent skimming, stirring to prevent stagnation at bottom of tayche and consequent charring, and slow boiling when the juice begins to thicken.

With regard to the skimming, an immense amount of impurities can be removed in this manner. The greatest opportunity for this will be found just before the juice commences to boil after charging with raw juice, a large quantity of scum generally rising at that time. Another good time will be found just after stirring, which causes the impurities to rise. The man in charge of the boiling should be trained to skim whenever he sees an opportunity. A good way of dealing with the skimmings is to have a tub with a piece of thick straining cloth tied over the top in such a manner as to form a depression. The skimmer is emptied into this, and the clear juice percolates through into the tub below. Otherwise it may be treated with the settlings.

Stirring need only be done occasionally until the juice begins to thicken, when it should be done frequently, taking care to work well down to the bottom of the tayche. The stirring is best done with an instrument formed of a piece of board about 18 inches long, rounded off on one side to fit the contour of the tayche, and attached to a long handle.

As the juice thickens the fire should be gradually damped down until when near the striking point, the juice is only just boiling sufficiently for the citrometer to record accurately.

It is advisable when the desired degree of concentration is attained to regulate the fire so that there is just sufficient left in the furnace for starting up again, or, if there is no more juice to be treated, to draw the fire altogether, as otherwise the latter part of the strike is apt to be burned before it can be taken out owing to the tayche becoming overheated.

The juice should always be struck in the last tayche from the fire, as otherwise it is almost impossible to avoid excessive charring. The strike should always be withdrawn from the tayche as quickly as possible.

The settlings may advantageously be employed in cooling the tayches. When treated cold, it is difficult to filter owing to gum and oil clogging the bags, but if previously heated, and put into the bags whole, still hot, it will be found to filter very readily.

To sum up, the essentials for the production of clean juice are—

Clean raw juice.

Careful boiling, paying due attention to skimming and stirring, and the avoidance of overheating in the final stages.

If these points are taken due notice of, there is no reason why clean juice should not be turned out.

With regard to the unavoidable loss in concentration by the open-fire method, while this system cannot compare with steam concentration in this respect, with careful working the loss can be greatly reduced, the writer having brought his down to 8·5 per cent.

* A description of the sediment test for lime juice will be found in the *Agricultural News* for November 6, 1915 (Vol. XIV, No. 353, p. 355).

Pigs in Cuba.—Cuba is an ideal country for the raising of hogs. The royal palm trees, of which there are millions in the island, furnish a food which is very much liked by the hogs, and which is very nutritious. Guavas, mangoes, and other fruits grow in profusion, and serve very well as feed. Moreover, the market for pork and all of its products, is always very good. Unfortunately, hog cholera is always epidemic, and causes such a high death-rate among the hogs as to make the business of hog-raising exceedingly precarious. No extensive statistics are at hand to show either the total number of hogs in Cuba or the number that die annually of cholera, but in many cases herds have been completely destroyed by this disease. There is no remedy known, but hog-cholera serum is a preventive, and the Experiment Station began preparing the serum about a year ago, and to date has prepared about 500,000 cubic centimetres, and used it with the greatest success.

We have met with a number of difficulties in the preparation of the serum which has prevented the working of the plant to full capacity, but at present we can see no reason why the difficulties should not be overcome, as they have been overcome in the United States. The importations of lard, hams and live hogs during the year 1912-13, amounted to $8,983,884, and during the year 1913-14 to $9,357,721. From these figures it will be seen what the placing of the industry in the condition to supply all the local consumption would mean to the Cuban farmers. (*Modern Cuba.*)

REPORT ON SAMPLES OF DOMINICA WATER.

Published in the Dominica *Official Gazette*, for May 29, is a report by Dr. H. A. Tempany, Government Analyst, Leeward Islands, on two samples of water taken in Roseau (1) from the intake of the Reservoir, and. (2) from the tap in the laboratory at the Botanic Gardens.

The analytical results, which are supplementary to those reported on previously show the composition of the water after a prolonged period of drought. The previous analyses were made with water taken after periods of considerable rainfall.

In point of view of the content of dissolved mineral matter the results are, in the circumstances, in surprisingly close agreement with those found in the case of the samples reported on in October last. From the point of view of the contained organic matter, the samples are slightly superior in quality to those previously reported on, and for snch types of upland surface water must be regarded as of extremely high purity.

The groups of analyses taken together indicate that under the range of conditions occurring at the times of taking the two sets of samples, the quality of the water supplied to the Town of Roseau leaves little to be desired when judged by the usual chemical standards.

UTILIZING PALMETTO IN THE UNITED STATES.

The scrub palmetto—of which there are several varieties, the most common being *Serenoa serrulata*—is a veritable pest in Florida, where vast areas are densely covered with the growth. Heretofore it has been put to little economic use; now, however, according to a report by a special agent of the United States Department of Commerce, a process has been perfected whereby mattings, bind r twine, and the like are made from fibre extracted from the leaves. This fibre takes dye readily, and its wearing qualities are said to surpass anything yet found in the way of floor coverings. Machines are set up in the palmetto fields and the leaves fed into them while green.

An aspect of the new industry that is of considerable value, apart from the manufacture of floor coverings, is that the twine made from the leaves is easily handled by grain binders, knots being tied without difficulty. For the manufacture of twine, however, the species known as the 'cabbage' palm (*Sabal palmetto*) is employed, as it yields a fibre of 3 to 5 feet long.

The 'cabbage' palm is native to the maritime parts of the United States from Florida to North Carolina. It attains a height of 40 to 50 feet, and has a crown of large palmate leaves, the blade 1 to 5 feet in length, and the footstalks long. The flowers are small, greenish, and in long racemes; the fruit black, about as long as a pea pod, and inedible. The leaves are made into hats, mats, etc., and are also largely used for thatch. The terminal bud or 'cabbage' is often eaten. The wood is extremely porous, but is preferred to every other kind of wood in North America for wharves, and it is very durable and not liable to be attacked by the teredo. The streets of Savannah and some other Southern cities are lined with these trees.

A second American species, the 'saw' palmetto (*Serenoa serrulata*), occurs from South Carolina to Florida. It has a short stem and numerous clustered fan-shaped leaves, while its berries have certain medicinal properties. A still smaller species is the dwarf palmetto (*Sabal Adamsonii*), a stemless plant which bears a cluster of leaves a foot or two long.

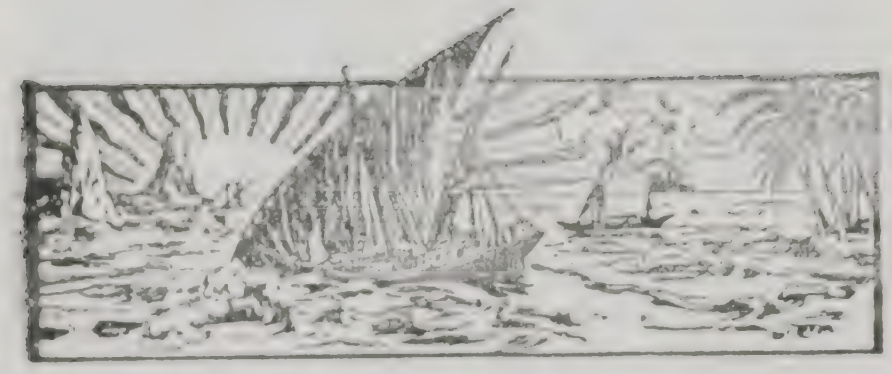
So far the scrub palmetto of Florida has been regarded as of little economic value. The leaves have been cut and shipped abroad (mainly to Germany), where they are turned into the 'artificial palms' so extensively used for permanent decorative effects. Export of palmetto leaves to Germany from the Florida customs district had an aggregate value of $11,650 (about £2,390) in the year ended June 30, 1914. The shipments to other States of America, of course, are very much larger. The fibre has been used to some extent for mattress stuffings, and upon special order has been utilized in mixing plaster.

While the plant contains some tannic acid, the commercial production of tanning extract has so far not been attempted on a large scale because of the competition of other materials more easily and cheaply obtained. Bees evince a fondness for the flowers of the scrub palmetto, but the resulting honey is dark-coloured and has a peculiar taste. (*Journal of the Royal Society of Arts.*)

Address to the Legislative Council of Dominica.—In the course of his address to the Legislative Council of Dominica on May 17, 1916, His Honour the Administrator said that he thought it was of the utmost possible importance that some industry other than that upon which the island now so progressively thrives (i.e. limes) should be started and maintained. He felt sure that there were considerable opportunities for successful work in other directions. He appealed to all those who have the opportunity to consider how they may best avail themselves of it while there is yet time. Coco-nuts seemed to His Honour to be the best solution. Sisal he considered a possibility, probably also vanilla; but he felt certain that the Agricultural Superintendent and Curator would be in a position to give sound advice in this connexion. His Honour referred to an experiment with coco-nuts that was in course of being carried out.

Hybrid Bougainvillaea.—The *Revue Horticole* for March 16, describes a new hybrid Bougainvillaea, which is said to be the result of an accidental cross between *B. spectabilis*, var. *lateritia*, and *B. glabra*. The cross is described by Dr. G. V. Perez, Saint Ursula, Teneriffe, who states that his plant of *B. s. lateritia* is growing in proximity to one of *B. glabra*. The first-named species has lately produced seeds, which gave rise to plants with foliage of a glabrous nature, the bracts of which were of the dark magenta colour of those of *B. speciosa* or *B. spectabilis*.

Rice Planting Operations in Trinidad.—Profiting by the favourable weather and the bright prospects, a great many agriculturists have been preparing their lands for rice cultivation principally in the Caroni, Savanna and Penal districts. In other parts attention is being also paid to the cultivation of this product, especially as more mills are being erected to deal with the paddy.



GLEANINGS.

The influence of manures on the composition and quality of tobacco, is a subject dealt with in the Ohio Agricultural Experiment Station Bulletin No. 285. The experiments described show that the composition is modified to a greater or less extent. Nitrate of soda tends to reduce the ash content. The addition of lime to the soil decreases the calcium and increases the magnesium in the tobacco. Smoking tests of cigars show that the quality of tobacco is impaired where muriate of potash is used as a fertilizer.

The Curator of the Botanic Station, Antigua, has issued a leaflet on papaw cultivation and the preparation of papain. Directions are given in regard to plants and planting, bleeding the fruit, yield, and drying the juice. It is believed that the future demand for papain will increase, while the industry is one which can easily be conducted by women and children, thereby not inconveniencing the major industries which require available labour. It is hoped in the future that a co-operative scheme for purchasing wet papain may be started.

It appears from the *Queensland Agricultural Journal* for April 1916, that the Government of that country is making another attempt to encourage cotton growing in parts of Queensland. A quantity of seed has recently been ordered from the United States, and this is expected to arrive in September, which will be in plenty of time for sowing the 1916-17 crop. The quantity imported is stated to be sufficient to plant 1,000 acres. It is expected that this will yield a return of £7,290.

Part 1 of Bulletin No. 361 of the Department of Landscape Art, of the Cornell University, deals in an attractive and instructive manner with the subject of laying out grounds and gardens with a view to obtaining certain desired artistic effects. Diagrams, for instance, are given to show the idea of planting borders of various characters to give the picturesque, varied, restrained or quiet effect. This publication will prove interesting to those who are concerned with the planting of trees and bush growth in Botanic or even large private gardens.

The chief medical officer of the English Board of Education, in his Annual Report for 1914, calls attention to the danger attendant on the employment of school children after school hours, which has been aggravated through the dearth of labour caused by the war. It is pointed out that this extra work interferes with the hours of sleep; it induces a tendency towards instability as regards future employment, and frequently brings children under many other deteriorating influences. It is stated that the subject needs the earnest and prompt attention of the authorities concerned.

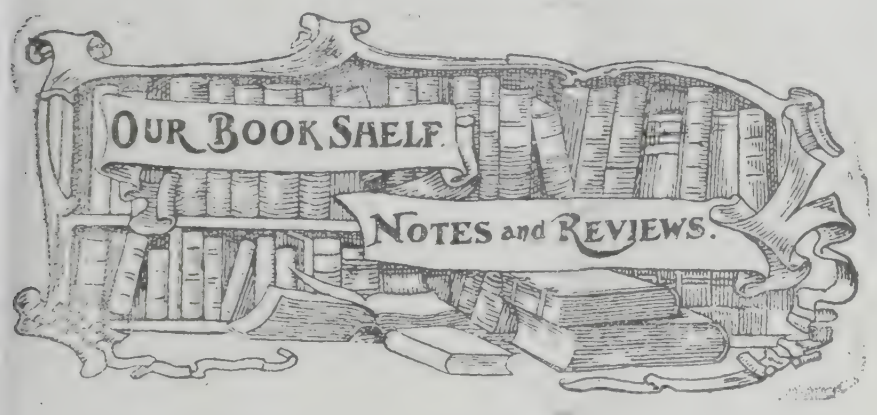
The native pasture grasses of the United States, dealt with in Bulletin No. 201, Bureau of Plant Industry, United States Department of Agriculture, includes *Sporobolus indicus*, the Bed grass or Wire grass of the West Indies, which is a characteristic species of the United States. Being coarse and early becoming woody, it is there a grass of secondary importance: but where feed is scarce, and especially in waste places, it often makes a good growth and furnishes considerable grazing. Figures of analysis show it to be a fairly rich fodder chemically, comparing well with many of the more luxuriant pasture grasses.

An ingenious mouse or rat trap is figured in the *Queensland Agricultural Journal* for April 1916. A small board, one end resting on the rim of an ordinary pail half full of water and the other end on the floor, is provided at the top end with an L-shaped piece of wire stuck into the end with its other end turned up and bearing a piece of bait. Between the top of the board and the vertical bend of the wire are three cotton reels. As the mouse or rat reaches the top of the board it endeavours to walk over the reels to get at the bait, but invariably slips off the reels and is drowned in the water below.

The Government Veterinary Surgeon of Trinidad, in his Report for 1914-15, states that with the exception of anthrax in cattle coming from Venezuela, there were no other contagious diseases among imported animals. It is stated that anthrax regulations are in force against St. Vincent and Demerara. It is mentioned further, that there have been some cases of hydrophobia in dogs, and that a good number of imported mules from America suffer from 'stranglis' or distemper, which however, is a more inconvenient than serious complaint. Generally the health amongst the animals of the Colony was good.

A leaflet issued by the United States Department of Agriculture (Bureau of Animal Industry) deals with the standards for dairy products, including the standards in Hawaii, the Philippines and Porto Rico. In Hawaii the standard is: total solids 11·5 per cent., fat 2·5 per cent.: in the Philippine Islands the standard is: total solids 11·75, solids-not-fat 3·25. In Porto Rico, the standards correspond on stated dilution to State standards for milk. In connexion with this note, see the article on composition of milk in the tropics in the last issue of the *Agricultural News*.

It is stated in *Modern Cuba* for December 1915, that the National Government of Venezuela has entered into a contract with a Company for the encouragement of the cultivation of fibre-producing plants in that country. The Company is obliged to plant, itself, or through another company or person, not less than 200,000 stalks of sisal (*Agave sisalana*) or some other plant, not more than 2,000 per hectare (2·74 acres), and to supply up to 25,000 bundles of sisal annually for six years, to be distributed among farmers who desire to attempt planting the crop, each lot of plants to be accompanied by a book of instructions. The Company was to begin planting this year, and to complete the contract required by the end of 1917.



SUB-TROPICAL VEGETABLE GARDENING. By P. H. Rolf, Director of the Experiment Station at Florida. *New York MacMillan Company*, 1916. Pp. 309, Plates XVI. Price 6*s.* 6*d.* net.

The extensive cultivation for domestic purposes of both temperate and tropical vegetables in the West Indies renders this book of great interest in these islands. Located midway between the temperate and tropical regions of the Western hemisphere, the author has been in a favourable position to furnish reliable information as to the tolerance of different vegetables in regard to climatic conditions. At the beginning of the book the author gives a considerable amount of attention to the subject of manuring: the reason for this appears to be the poor sandy quality of the soils of Florida, for which State the book has been primarily written. In dealing with the special question of manures for vegetable gardens in warm countries, the importance of compost manure is referred to, and it is stated that if one has determined for what crop the compost is to be used, proper amounts of commercial fertilizers should be added as the pile is prepared. While emphasizing the importance of manuring, the rotation of crops is not neglected, and it is advocated that a crop of vegetables should always be followed by one having as widely different requirements and habits as possible. At the same time certain crops are especially able to grow repeatedly on the same land without showing any falling off in quantity or quality of yield. A good example of such a crop is the onion, of which considerable quantities are now grown in the West Indies.

After dealing briefly with the problem of water and watering, the author gives attention next to seeds, their testing and sowing. A succeeding chapter deals with pests and diseases, principally consisting of formulas for the preparation of poisonous and contact insecticides and fungicides.

The principal part of the book describing different vegetables, their characteristics and cultivation starts in Chapter X. This deals with vegetables with edible leaves or stems, and consideration is first given to the cabbage. It is observed that this plant is the commonest temperate vegetable grown in the West Indies, and in India. In regard to a related cruciferous vegetable, namely Brussels sprouts, it is said that this does not appear to succeed in winterless climates. The cauliflower is recommended for private or local use in tropical land, where there is a distinct cool season (as in the hills of Jamaica, St. Lucia, and Dominica), especially if grown under a slat shed or under cheese-cloth on a small scale. The seed for warm climates should be procured, like that of the Bermuda onion, from a warm country. Many persons prefer the cauliflower to any other vegetable, and attempts to cultivate this plant in the West Indies deserve encouragement.

In regard to other vegetables with edible leaves, considerable attention is given to lettuce. In raising this plant, as soon as the seedlings are up strongly, and before the leaves begin to form, the largest should be picked out with the point of a knife. This is said to give stronger and better plants. Nitrate of soda dissolved in water (about an ounce to a gallon) is often sprinkled on young lettuce beds to hasten growth. The cabbage lettuce is regarded as best for tropical climates. Amongst further plants dealt with of the edible leaf class is parsley and water-cress. The former can be grown best in the tropics under shade; as regards the latter, it is stated that this is found growing wild in the West Indies along the banks of streams. In Barbados, water-cress is frequently grown in special beds at the base of windmills.

Enquiries are often heard in the West Indies concerning the possibility of growing asparagus. The edible shoots which form this vegetable, however, sprout up in quantities only after the plants have been resting during the cold season; thus in regions where there is no cold, but only a cool season, asparagus does not flourish. It is grown as far South as Central Florida.

Turning to the class of vegetables with edible bulbs attention is first given to that important vegetable, the onion. The cultivation of this crop has received such careful attention in places in the West Indies where it is extensively grown, that there is little reason for reproducing the information given in the book under review; but its perusal in detail should prove of interest to West Indian growers. Other bulb vegetables referred to include the leek, which grows well in the West Indies, the shallot, and garlic.

The vegetables with edible fruits belong practically to the Cucurbitaceae and the Solonaceae. Examples are melons, cucumber, squash, tomato, egg plant, and pepper. Useful information is given concerning the cultivation of all these plants. The vegetables with edible seeds, which are dealt with in a later chapter, consist principally of peas and beans. In this connexion special reference may be made to the suitability of Lima beans for the tropics. The importance of the ground nut as a food product is referred to, and its cultivation described.

As regards tuberous vegetables, it is of interest to note that the Irish potato originated in regions of high altitude, and this is supposed to be the reason why this plant is so intolerant to climatic extremes The Irish potato does not withstand extremes of either heat or cold, or excessive moisture or drought. Thus this plant does not succeed well in the tropics. The sweet potato, however, can be grown throughout the tropics and sub-tropics.

The remaining vegetables dealt with include cassava, tannias, horse raddish, spinach, gourd, parsnip, carrot, and many others.

From the above account of the contents of this volume it will be realized that its range is a very comprehensive one, and that the greater number of the plants dealt with can be produced satisfactorily in the West Indies. There is one point in cennexion with the production of temperate vegetables in the West Indies that should prove encouraging, and that has regard to the fact that temperate vegetables are appreciated by visitors who arrive in the island in considerable numbers, especially during the cool season from northern countries. Americans and Europeans as a rule, do not like tropical vegetables.

Perusal of this volume impresses one with the idea that the production af temperate vegetables could be facilitated and improved by the more general adoption of shade. It would be interesting if experiments could be conducted with such plants as cauliflower, parsnips, turnips, and carrots, under cheese-cloth. It might be found that growth would be stimulated as it is in the case of the tobacco plant, and, what is more important, it might be found that the characteristic flavours of these distinctive vegetables might be accentuated to a degree attained where the plants are grown in cold countries.

PLANT DISEASES.

PINK DISEASE IN THE WEST INDIES.

Since the first description of pink disease by Zimmermann (Java, 1901) a considerable amount of attention has been given to it in the Eastern Tropics, especially since its appearance as a somewhat serious enemy in plantations of Hevea. Its range of hosts, both wild and cultivated, is an extremely wide one, and under certain circumstances, it is responsible for a considerable amount of damage. Its presence on wild plants makes it difficult to eradicate from estates bordering on forest.

The disease causes the death of twigs and small branches. Its most obvious characteristic is the production of a fairly uniform pink coating on the surface of the bark, and sometimes the leaves, of the affected parts while they are still alive, so that they appear as if they had been well dusted with carbolic tooth powder. Later the coating turns grey and scales off.

The fungus causing the disease in the East was described as a new species under the name *Corticium javanicum* by Zimmermann, a name which was later changed to *C. Zimmermanni*. Further investigation showed its identity with *C. salmonicolor*, B. et Br., described from Ceylon in 1870, and this name having priority is now accepted.

The occurrence of a closely similar disease in the West Indies has been known from 1906, and several writers have suggested that the New and Old World diseases might be identical. At the instance of Dr. van Hall specimens were sent from this Office in 1913 to Dr. Rant in Java, but no information was received concerning them.

The circumstances attending the discovery of pink disease in the West Indies were as follows:—

In 1906 Mr. Joseph Jones, Curator of the Botanic Gardens, Dominica, forwarded to the office of this Department diseased cacao twigs sent in by Mr. Sowray, who stated that the disease caused the trees to die back considerably. An appended note by Sir Daniel Morris, Imperial Commissioner, says, 'This is the first time we have had authentic specimens of the "pink" disease.' In the same year further specimens on cacao were sent in by Mr. Bryant, and on lime by Mr. Fletcher, the latter from an estate where the disease was rediscovered on limes in 1914 by the writer. Specimens of the fungus were reported by Kew to be immature and not suitable for identification. In 1907 fresh material on cacao was collected by the Curator, and forwarded to Kew. A reply in the name of the Director was received to the effect that the fungus was *Corticium lilacino-fuscum*, Berk. & Curt., and this name has been in general use in the West Indies until recently. Specimens showing the disease were forwarded from St. Lucia later in the same year, and it has since been recorded from Trinidad and Porto Rico.

At no time has it appeared as more than a local trouble, and material for study has been difficult to obtain. At the instance of Dr. Butler, Imperial Mycologist for India, Mr. J. B. Rorer, Mycologist to the Board of Agriculture, Trinidad, has recently collected specimens on cacao in Trinidad, which were submitted to Kew and examined by Miss E. M. Wakefield, while further specimens, together with material of the disease on limes in Dominica supplied through this Department, were examined by Professor Burt of the Missouri Botanical Gardens, an authority on the group. Mr. Rorer has now published the replies received, together with an account of the disease, in the *Bulletin of the Department of Agriculture*, Trinidad and Tobago, Vol. XV, Part 3.

Miss Wakefield reported as follows:—

'The specimens of West Indian "Pink Disease" forwarded by Mr. Rorer are wrongly determined as *Corticium lilacino-fuscum*. I have compared them with *Corticium salmonicolor*, B. et Br., and consider that they should be referred to this species.

'The West Indian specimens do not show the characteristic cracking of the hymenium quite so plainly as is usually the case in the Eastern forms, but in some of the specimens it is quite evident under the lens. No Necator stage is present in this material.

'With regard to the spore difference noted by Mr. Rorer in his letter to Dr. Butler, the spores are somewhat variable in width, but I have rarely seen them quite so narrow as Zimmermann figures and describes. They are usually more or less broadly pip-shaped or obovate.

'The spores resemble those of *C. roseum*, Pers., but this species differs from *C. roseum* in its less fleshy consistency, and in the much broader basal hyphae.'

Professor Burt reported:—

'With regard to the pink disease the specimens from Dominica (on lime) do not differ with regard to the fungus from the specimen which you have sent from Trinidad (on cacao). It seems that the pink disease is very probably caused by the same species of Corticium in both the Eastern Hemisphere and the Western. Yours is not caused by *Corticium lilacino-fuscum*.

'During the latter part of December, I received from Kew Herbarium, a specimen of *Corticium salmonicolor*, B. and Br., collected in Ceylon by T. Petch, which agrees exactly in colour, cracked habit, and all structural details with the specimens of "pink disease fungus" which you sent me. A fragment of the authentic specimen of *Corticium salmonicolor* from Ceylon, determined by Berkeley, was also sent to me. Sectional preparations from this specimen are of exactly the same structure, spores, etc., as Petch's specimens and your collections.

'Miss Wakefield writes to me that she has studied the specimens which you sent to Kew and compared them with the Ceylon material of *Corticium salmonicolor*, and believes your specimens to be *C. salmonicolor*. I agree with her. *Corticium roseum* is the next thing to *C. salmonicolor*, but it has bushy branched paraphyses between the basidia; these paraphyses are often very conspicuous. I have found no paraphyses of this sort in the "pink disease fungus." The absence of these paraphyses and the coarser hyphae of *C. salmonicolor*, and the fact that *C. roseum* is strictly saprophytic, wherever observed, show that these two fungi are distinct species.'

There is thus no room for doubt that the West Indian disease is identical with that in the East. There was only one point left outstanding in this connexion, i.e., as to the identity of the particular specimen sent to Kew in 1907. A portion of the same material is still preserved here, and a comparison of this with duplicate material of that supplied to Mr. Rorer shows no point of difference.

That this disease has not assumed in the West Indies anything like the importance it has in the East would appear to be due to differences in climate. The fungus is dependent on a very considerable amount of moisture for vigorous growth. Even in Dominica and St Lucia, the wettest of the Lesser Antilles, there are few places opened up to cultivation which are not penetrated more or less by wind and sun all the year round; it is notable that the disease on the lime in Dominica is only known to exist in one specially sheltered situation, although it was recorded from the same estate ten

years ago. As it occurs now, it is very scattered and of no economic importance.

In Trinidad, according to Rorer, the disease has been found on cacao only at rare intervals, in the northern and eastern districts, and has not proved a serious trouble. In Port Rico it occurs on cacao, has been found in two instances on grape fruit, and in one situation on coffee. The hosts recorded in the publications of this Department are cacao, lime, pigeon pea, and oleander. To these records Rorer adds Amherstia.

The simplest and most effective way to treat the disease is by cutting off the branch on which it occurs at its junction with the next older branch or the stem, taking care to cut well below the affected part. The branch removed should be burnt or buried. Tarring the affected parts may be adopted as an alternative.

W.N.

STEAM STERILIZATION OF SOILS.

In raising tobacco and onion seedlings it is often desirable, if possible, to fumigate the soil of the seed beds.

The ground may be sterilized by live steam from a boiler conducted by a steam hose to a large pan or tank, 12 feet long by 6 feet wide and 8 inches deep. This is inverted over the bed, the edges being pressed firmly into the soil and the ground tramped firmly against the edges to keep the steam from escaping. The steam is then turned on gradually under a pressure of 100 lb. at the boiler. The steam should be kept at this point and left on for at least forty minutes, during which time the soil temperature should rise to about 98° C. at 4 or 5 inches under the surface. This temperature is enough to kill all insects, grass seed, algae, and fungus which may be in the soil. Moreover, the partial sterilization of the soil has a beneficial effect on the growth of the plants in the seed beds.

When one 12-foot section of the beds is sterilized, the steam is turned off for a few minutes till the pan is carried forward to the next section, and so on. The ground should be covered with sacks when the pan is taken off, to conserve the heat a while longer. About fifteen hours after sterilizing the soil will be cold enough to sow the seed, which should be done as soon as possible. The beds may be boarded up at the sides or not, just as the planter desires; but some provision should be made for shading the beds with canvas or cheese-cloth, at least until germination takes place, and a few weeks afterwards. Also, seed beds sown early in the season should be so fixed that they can be covered, and the plants protected in time of hurricanes. At such times seed beds as a rule are all lost because of exposure. (*Modern Cuba*, December 1915.)

A lengthy article in *Nature* for May 25 describes the present position of industrial research in the United States, indicating the great deal that has been accomplished by the Government, but more especially by individual firms. This has regard to research connected with manufacturing industries. As regards agriculture, the article states 'the United States Department of Agriculture is of some interest in that it carries on a scheme of investigational work on national lines.' This remark appears to be inadequately appreciative of the importance of the United States Department of Agriculture, which is the largest establishment of its kind in the world, and is comprised of an organization that might well be imitated in any scheme having regard to the application of science to the manufacturing industries in Great Britain

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of May:—

The state of the markets in products of West Indian origin, during the month of May, has shown but little change since our last report. Imports and exports have both been fairly regular in bulk and values, with but slight changes in the latter, though generally they have maintained the advance prices assumed at the beginning of the war. Citric acid is perhaps the one exception which reached its top figure of 4*s.* per lb and dropped to 3*s.* 9*d.* at the end of the month. The following are some of the details.

GINGER.

At the auction on the 17th, 288 bags of Cochin were offered and 128 sold. Good bright new washed fetched 47*s.* 6*d.* per cwt; 16 cases of dull, wormy, unsorted native cut were all bought in at 51*s.*; a quantity of limed Japanese was also offered and bought in at 45*s.* per cwt.

SARSAPARILLA.

At auction on the 4th of the month no grey Jamaica was forthcoming; Lima-Jamaica was represented by 7 bales, none of which sold; 11 bales of native Jamaica were brought forward and disposed of, dull pale red fetching 10*d.* per lb., and fair red 1*s.* At the end of the month it was reported that grey Jamaica was selling at 1*s.* 11*d.*, Lima-Jamaica at 1*s.* 7*d.*, fair native red Jamaica at 1*s.* 2*d.*, and Mexican at 9½*d.* per lb.

PIMENTO, LIME JUICE, LIME OIL, CASSIA FISTULA, AND KOLA.

Pimento has been quoted at a very low figure due, it is said, to the prohibition of certain exports. A large quantity, offered at the beginning of the month, was bought in at 3¾*d.* per lb. There has been no change in the position of lime juice since last month's report, though enquiries have been made for it. Of lime oil, at auction on the 4th of the month, 4 cases of hand-pressed St. Lucia were offered and withdrawn at 10*s.* per lb., but a week later it was stated that some sales had been effected at that figure, and for West Indian distilled 9*s.* was paid. A week later fair West Indian distilled was to be obtained for 8*s.* 6*d.* and hand-pressed at from 9*s.* 6*d.* to 10*s.* At the first auction in the month 50 packages of Cassia Fistula pods were brought forward, but failed to find buyers. A week later, however, some sales were effected at 60*s.* per cwt. At auction on May 4, 23 packages of kola nuts were offered, and only one sold, 6¼*d.* per lb. being paid for fair dried Grenada halves. Towards the end of the month, however, the bulk of this consignment was disposed of, fair bright West Indian fetching 6½*d.* per lb.

The principal disease affecting sugar-cane in British Guiana during the past year was root disease caused by *Marasmius sacchari*. This was however, present to a less extent than in the previous year.

MARKET REPORTS.

London.—The West India Committee Circular, June 15, 1916.

Arrowroot—2¾*d.* to 3*d.*
Balata—Sheet, 3*s.* 2*d.* to 3*s.* 4*d.*, block 2*s.* 6¼*d.*
Beeswax—No quotations.
Cacao—Trinidad, 87/- to 89/-; Grenada, 82/- to 85/-; Jamaica, 77/- to 84/-.
Coffee—Jamaica, no quotations.
Copra—£32.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 105/- to 115/-.
Isinglass—No quotations.
Honey—45/6. to 63/-.
Lime Juice—Raw, 2/10½ to 3/1½; concentrated, no quotations; Otto of limes (hand-pressed), 9/-.
Logwood—No quotations.
Mace—7*d.* to 3*s.*
Nutmegs—9*d.* to 1*s.* 2*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/9; fine soft, 2/6½; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 1, 1916.

Cacao—Venezuelan, $15·00; Trinidad, no quotations.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$6·00 to $6·50 per 100 lb.
Dhal—$7·00 to $7·75.
Onions—$5·00 to $5·50 per 100 lb.
Peas, Split—$11·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·25 to $7·75; White., $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., June 28, 1916; T. S. Garraway & Co., June 27, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·50 per 100 lb.
Coco-nuts—$18·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda no quotations; Cacao manure, quotations; Sulphate of ammonia, $105·00 to $110·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $4·50.
Peas, Split—$11·00 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $7·38 to $7·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·50.

British Guiana.—Messrs. Wieting & Richter, May 31, 1916; Messrs. Sandbach, Parker & Co. June 2, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker, & Co.
Arrowroot—St. Vincent	——	$14·50
Balata—Venezuela block	——	——
Demerara sheet	——	68c.
Cacao—Native	17c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	$9·00	——
Coco-nuts—	$18 per M.	$24 per M.
Coffee—Creole	13c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$6·75 to $7·00	$6·50 to $7·25
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	8c. to 11c.
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 72c.	——
Potatoes—Nova Scotia	$4·00	$4·50 to $4·70
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·80	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$6·40 to $6·75
Tannias—	$2·88	——
Yams—White	——	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $4·60	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 56c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$5·00 to $7·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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The Spread of Economic Effort within the West Indies.

IT is very seldom that we find a new economic movement initiated in several places simultaneously. Before making an effort to put any such scheme into action, records show that there is generally a preliminary period of discussion, after which one place at last takes the lead, and demonstrates, at its own risk, the success or otherwise of the scheme in hand.

The island of St. Vincent has been the scene of a considerable amount of this experimental work in economic affairs, and many other islands in the West Indies have benefited by the successful demonstrations that St. Vincent has made. This island appears to have been the first in the British West Indies to undertake a definite land settlement scheme. As early as 1885, in connexion with the survey of the Crown lands boundary, an attempt was made to form a land settlement for the local peasantry. This, however, was affected adversely by the disastrous hurricane of 1898; but in 1899 the policy was continued by the Government purchasing two estates in the neighbourhood of the capital town. Since that time the scheme has made steady progress, not only in connexion with the inclusion of fresh land, but also in regard to the organization of agricultural methods amongst the occupiers.

The establishment of land settlements in St. Vincent led, in 1903, to the purchase by the Grenada Government of two estates in Carriacou, a dependency of Grenada, and in 1910 Grenada itself began on a modest scale. At the present time the settlements in Grenada occupy some 600 acres. In 1911 Union Island, one of the northern Grenadines, was sold to the St. Vincent Government and opened up for settlement under the supervision of the Commissioner of Carriacou. More recently, in 1913, St. Lucia entered upon a definite policy of land settlement for peasants at Réunion estate, purchased by the Government, and over 200 acres have been allocated for settlement. As well as this, the Governments of St. Lucia, Dominica, and Trinidad have endeavoured to attract European settlers by means of affording facilities in regard to the occupation of larger areas of Crown lands on an estate scale. This latter move possesses special significance

in connexion with the land settlement of ex-service men after the war.

The Government of St. Vincent has the further distinction of being the first British Crown Colony to introduce legislation and machinery for the establishment of agricultural credit societies under the Raiffeisen system of unlimited liability. The matter had been the subject of much discussion for many years previously in Trinidad, and in British Guiana. But St. Vincent was the first to take the lead, although even there it did not take place until so recently as 1913. It has to be remembered in this connexion that St. Vincent was better constituted than most other islands as an experimental ground for such a credit scheme, the peasantry being comparatively sophisticated, partly as the result of the educational influence of a properly carried out land settlement scheme. At the same time nothing would have been done had it not been for the enterprise of an energetic local Government.

The co-operative credit scheme has taken hold in St. Vincent and may be said to have proved very successful, considering the many initial difficulties which matters requiring mutual trust involve. In 1915, the Government of Trinidad passed a credit Ordinance based on the St. Vincent one, and in the same year the Government of St. Lucia did the same. Recent information indicates the spread of this economic effort to Dominica, while in Grenada the question of credit in kind, if not in money, is now under consideration by the Government of that Colony.

Reviewing the facts outlined above, it will be admitted that St. Vincent is an island of considerable interest in regard to the history and development of State economic effort, and it will be seen that two most important schemes—land settlement and co-operative credit—first had their West Indian origin in that Colony.

While St. Vincent has also moved in the direction of unofficial economic schemes, that is to say, in the direction of purely commercial organization, it is in Antigua that one finds this kind of effort in its most pronounced manifestations. The establishment in 1913 of an Onion Growers' Association was not only an event of interest but has since proved itself to be an event of great commercial value. The co-operative method of dealing with the Antigua onion crop which this association of growers employs, has been referred to so often in these pages that it is unnecessary to repeat the information here. The essential point to note is that the scheme proved so successful that last year both Montserrat and the Virgin Islands formed associations on similar lines, and these associations were affiliated to the original Antigua combination. Nevis, while it may not have a definitely established association, is at any rate making efforts to develop an onion industry along the lines indicated by the Associations in sister Presidencies. This affords a clear and distinct case of the spread of economic effort, and it is of a particularly satisfactory nature because the diffusion has been confined to the units of the same Colony—the Leeward Islands.

Antigua has recently established, as one result of the West Indian Cotton Conference held in St. Kitts last March, a Cotton Growers' Association. The object of this body, which includes all the principal growers, is to regulate and deal with all matters affecting the island's industry as a whole, and it may be prognosticated that similar associations will sooner or later spring up in other cotton-growing islands, especially if the Antigua Association shows that it is of material value in connexion with the progress of the industry. Looking further ahead, if several of these associations arise, it may be expected that this will be followed by a general association for the whole of the West Indies, and one can conceive the organization of annual general meetings that should be of great benefit to so complex a business as the growing of cotton and its disposal.

In concluding the subject of the spread of economic effort in the West Indies, reference may be made to what was originally an experimental project in St. Lucia. We refer to the St. Lucia Government lime juice factory, established in 1913. This was inaugurated to assist primarily the small growers of limes, but it was hoped that its successful working would prove a useful demonstration for the larger estates, in the direction of showing the advantages that accrue from steam concentration and other methods making for increased efficiency of manufacture. That this hoped for result has been achieved is shown by the fact that several estates in St. Lucia have put up similar steam plants as a result of the demonstration.

Further, the demonstration has had its effect externally, for the Government of British Guiana sent a special representative last year to enquire into and report upon the working of this model factory, with the result that a factory run on similar lines has been established in that Colony.

In Dominica the work of the St. Lucia factory has been closely followed, and this has not been without influencing the minds of lime growers in that island.

Lastly, reference may be made to the spread of economic effort in connexion with the sugar industry. A case in point is afforded by the establishment of central sugar factories in the Leeward Islands. It was here again that one place, Antigua, was the first to move in the matter with the establishment of Gunthorpes Factory in 1905. Its successful operations were largely responsible for the erection of a similar factory in St. Kitts in 1911, and the work of both these establishments has been to a large extent responsible for the increased centralization of factory work in Barbados.

The spread of economic effort in the West Indies, therefore, has originated from restricted activity in individual islands, of which islands St. Vincent and Antigua must be regarded as occupying a foremost position in this respect. An important principle can be learnt from this spread of economic movements, namely, that the value of starting a land settlement scheme or a co-operative credit scheme in St. Vincent, or a central factory or different growers' associations in Antigua, or a model lime juice factory in St. Vincent —the value of each one is not to be gauged merely by the success of the initial undertaking, but also by the educational influence and stimulus it exerts, by force of demonstration, to hasten progress along similar lines in other places.

This principle is frequently overlooked, but it is very important that it should be appreciated, especially by those who are concerned with the direction and financial support of agricultural policy, and also by those who are dubious of the valuable work applied economic science can do for the benefit of the planter and of the peasant.

The instructions issued to surveyors of shipping by the Board of Trade in Circular 1572, state that the required buoyancy of life-jackets may be supplied by cork, kapok or other approved substance, but no life-jackets which depend on air compartments for their buoyancy will be accepted. The cork used in the manufacture of life-jackets should not weigh more than 12 lb. per cubic foot, and must be of good quality, cleaned, and in pieces not less than 20 cubic inches, except for shoulder or other special pockets. Kapok must be pure Java kapok, of good quality, free from seeds or other foreign matter, and well cleaned. At least 24 oz. of kapok must be in each life-jacket whose buoyancy is derived from this material. It is presumed that the term Java is used in the sense of denoting a special quality: in that case the Board of Trade would allow, it is supposed, the employment of equally good kapok produced in the British tropics.

THE TRUE AND THE FALSE BAY TREE.

Mr. W. C. Fishlock, Curator of the Experiment Station Tortola, has recently forwarded to Dr. Tempany, Superintendent of Agriculture for the Leeward Islands, an interesting note on the subject of the growth of *Pimenta acris* from seed.

This note may be prefaced by saying that there exists in various parts of the West Indies, in addition to the recognized type of *Pimenta acris* which produces the Bay oil of commerce, a variety closely similar in appearance, but yielding an oil with a strong lemon scent and of little commercial value. (*West Indian Bulletin*, Vols. IV, pp. 119 and 189; IX, p. 275). The name applied to it by Mr. Fishlock—'lemoncillo'—is in use in Porto Rico. A proposal was made (*West Indian Bulletin*, Vol. IV, p. 194) to call the variety *P. acris*, var. *citrifolia*; but as this proposal is anonymous and unaccompanied by any attempt at description other than of the scent, it cannot be regarded as adequate. The lemon-scented variety is common in Dominica and St. Lucia. In Tortola it is the kind commonly met with, the type being rare, whereas this condition is reversed in St. Jan.

After stating that in company with Dr. Tempany he has recently made an examination of the Bay tree plot at the Experiment Station, Tortola, with a view of determining the number of plants of the lemoncillo variety present, Mr. Fishlock continues:—

'The trees in the plot were planted in November 1914 by Mr. C. A. Gomes; they had been raised from seed carefully picked and sown by me personally about July and August 1913. The seeds were carefully handpicked from a single tree having excellent characters, growing in the Station. This tree came from St. Jan in 1902 with some others, and was planted by me at the Station. Only two of the trees then planted have survived; one is a tree having good characters, and undoubtedly of the true variety; the other is unmistakably of the false or lemoncillo type. The latter tree flowers earlier than the true variety, and consequently, I do not think there has been cross-fertilization.

'Upon careful examination of the plants in the plot referred to, we found that, of sixty-two living plants, twenty-two or 35·5 per cent. were of the false, or lemoncillo type. This appears to indicate that the original plant, the one planted in 1902, is a hybrid, and that its progeny are splitting up into two distinct types—roughly 65 per cent. coming true, and 35 per cent. reverting to the lemoncillo type.

'There was nothing in the appearance of the plants, or the leaves, to indicate whether they belonged to the true or the false type; this could only be determined by the sense of smell.

'These observations may help to throw some light upon a subject which has already received some amount of attention. It is, of course, of the highest importance that, in the production of a high class Bay oil, there should be no admixture of leaves of the lemoncillo type.'

If Mr. Fishlock's suggestion turns out to be correct, the fact is of considerable importance where cultivations of Bay trees are being established, as in Montserrat. The lemoncillo is reported to be absent from that island, and its introduction should be carefully avoided. In islands where both varieties occur early discrimination should be made among the seedlings.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore's report for June states that the condition of the cacao was good, while limes were satisfactory, on the whole, and more planting was just beginning. A report on the financial condition of the Grenada Land Settlement, prepared by the Agricultural Instructor, shows results that are very satisfactory in comparison with those of last year. The Superintendent of Agriculture gave lectures at public meetings of the Agricultural Society during the month. As regards the distribution of plants, it is stated these were as follows: limes 200, coco-nuts 7, grafted mangoes 4, miscellaneous 51, together with 50 lb. of horse beans. The rainfall for the month at Richmond Hill was 7·13 inches.

ST. VINCENT. According to Mr. W. N. Sands's notes for the month of June, work in the Experiment Station included the planting of selected corn and two varieties of cane (B.208 and B. 6450), as well as ground nuts, beans, American corn seed raised locally, and eight varieties of green dressing received from the Imperial Department of Agriculture. Work in the Botanic Gardens included the grafting of mangoes and the sowing of cacao in pots. The weather during the month was favourable, and 12·24 inches of rain was recorded at the Botanic Station. Good progress was made with cotton planting throughout the island and the seed sown has germinated well. At Bequia and Mustique, young lime trees are making good growth. Two small plots of Lima beans at Bequia gave very fair returns last season, and an extension of planting is anticipated. Shipments of sugar and molasses during the month were made to Canada. Mr. Sands adds additional notes in connexion with special efforts by the Agricultural Officers. Meetings of planters were addressed and six visits were paid to the Government Ginnery to advise on technical matters. It is stated as a fact of interest that the 'millions' fish sent from the Botanic Gardens last year to Bequia have become well established in the swamps at the northern end of that district. The Assistant Agricultural Superintendent has paid several visits to estates in the Windward district of the island. As regards the work performed by the Cotton Inspector, it is stated that this officer visited cotton districts in connexion with the destruction of the native food plants of the cotton stainer. He also visited Canouan and Union Island, where he advised growers concerning the use of good seed for planting.

ST. LUCIA. It is stated by Mr. A. J. Brooks that the cane crop has been completed at Réunion and that attention has been given to the planting of limes, and to the budding of limes and oranges. During May, cacao was flowering freely, while limes were flowering and fruiting. It is stated that large areas are being cleared for further planting of limes. As regards the lime juice factory, the extension of the building continues and the vats have arrived from Demerara. The crop was expected to be in full swing during July and August. There is a steady extension of the area under sugar-cane. Meetings were held in connexion with agricultural banks. A special effort of the Agricultural Superintendent consisted in a journey made with the Colonial Engineer over the new road running inland from Micoud to Soufrière, for the purpose of gaining information as to the agricultural value of the land suitable for settlement opened up by this road. The best lands run from the Micoud end of the road, for a distance of from 10 to 11 miles.

DOMINICA. In Mr. Joseph Jones's items of local interest for June, it is noted that a considerable amount of grafting, budding and cultivation work was done in the nurseries at the Botanic Gardens. At the lime experiment station, operations consisted of spraying, weeding, cutlassing, manuring, and picking and recording the present crop. Similar work was done in the cacao experiment station. Plant distribution from the nurseries consisted of limes, 4,900; shade trees, 600; miscellaneous, 106: total 5,606. In regard to the condition of the staple crops, it is stated that the lime crop for 1916 is promising, and by now should be coming in. There was a good second flowering observable during the last few days of June. One or two forward contracts for citrate of lime have been made at favourable prices. Special efforts have included a meeting held in the Government School at Lá Plaine, at which the possibilities of establishing an Agricultural Credit Society in the district were considered. A report on the subject will be prepared in due course for the information of the Government. With regard to agricultural instruction, thirteen applications have been received from candidates for admittance as agricultural pupils, and an examination of agricultural pupils and the selection of candidates were contemplated. The rainfall for the month at Roseau was 4·82 inches. This is considerably below the average for June; otherwise weather conditions were normal

MONTSERRAT. Mr. W. Robson writes to say that a dry month again hampered the work in the experiment station. It has also had a very prejudical effect on the island's cotton crop, particularly in the early-planted fields. Much boll shedding was reported from the Windward district. On the fields planted in May, the bad effect is not so apparent, and the absence of high winds has told much in the crop's favour. The sales for last season's crop ranged from 17*d.* to 18*d.* — a considerable portion at the latter figure. In regard to the lime crop, Mr. Robson states that the fruit on the trees resulting from the March flowering will be very small if rains do not come at once. The dry weather has tended to encourage the prevalence of pests and diseases. Two new types of maize were received from the Montserrat Company, obtained by them from an Experiment Station in Mexico. A trial is being made with the St. Kitts No. 342 type of cotton.

ANTIGUA. Routine work has included the reaping of the variety and manurial experimental cane plots, and the planting of various plots of cotton and provision crops. A large number of sweet potato cuttings were distributed during the month. As regards the condition of the staple crops, Mr. T Jackson states that in certain parts the young cane crop is beginning to feel the effects of dry weather. It is stated not to be serious, and the appearance will soon disappear after the receipt of good rains. The reaping of last year's cane crop was still being continued at the end of June. Small areas of cotton have been planted, and special work has included the selection of cotton seed of pedigree strain tor planting purposes. During the month a meeting of the Board of Management of the Antigua Cotton Growers' Association was held. At the Government laboratory, three lectures were given to junior officers attached to the Agricultural Department.

ST. KITTS. According to Mr. F. R. Shepherd, the principal work in the experiment station during June consisted in the planting of various plots of provision crops. As in Montserrat and Antigua, so in St. Kitts the weather was very dry during the month at the Botanic Gardens. In the country, the weather appears to have been more favourable, especially for the reaping of the crop. Some of the valley

estates had at the time of writing finished cutting. The Central Factory this season has made some 10,700 tons of sugar and it was expected that the factory would close down about the middle of July with between 12,000 and 13,000 tons. The young cane crop is well advanced, and in the Northern district where there has been good rains, the plants are in excellent condition. The prospect generally speaking are very favourable as regards the sugar cane crop. The cotton crop has now been all planted, and in the Northern district the earlier cotton is bolling well. In the valley, some trouble has been experienced in establishing the young cotton owing to the dry weather; there has been no soaking rain but only showers at intervals of a week or so Mr. Shepherd states that a very satisfactory report has been received from Mr. J. W. McConnel on the four samples of cotton lint sent to him for spinning tests. About 500 acres of cotton will be planted in St. Kitts from this strain of seed.

VIRGIN ISLANDS. Work in the Tortola Experiment Station during May appears to have consisted chiefly in the weeding of the different plots. A good deal of interest, says Mr. Fishlock, is being shown in the coming cotton crop. There has been quite a considerable amount of seed already sown, notably at Virgin Gorda and Jost van Dykes. During May a visit was paid to Virgin Gorda and also to Anegada. During the first part of May the weather was dry; but from the 20th onwards it became more favourable.

THE COCO-NUT INDUSTRY IN BRITISH GUIANA.

The area planted with coco-nut palms in the colony has been slowly increasing for some years, but during recent years there has been much greater activity in coco-nut planting, and the continued extension of the industry may be expected.

The coco-nut palms growing in the colony are scattered, being owned chiefly by small growers; but there are a few fair-sized coco-nut estates, and the large proprietor is paying increasing attention to the cultivation of the palm. On one estate, where coco-nut planting is being carried out on a large scale, upwards of 50,000 trees have been planted, while another property possesses 20,000 trees. The acreage in the colony under cultivation in coco-nuts in 1914-15 was 15,894—an increase of 1,717 acres over that of the previous year. The gradual extension of the industry is shown in the following table:—

Year.	No. of acres planted.
1904-5	5,140
1905-6	6,560
1906-7	6,700
1907-8	6,828
1908-9	8,315
1909-10	9,466
1910-11	9,761
1911-12	12,236
1912-13	13,698
1913-14	14,177
1914-15	15 894

A very large proportion of the acreage is still young and has not yet come into bearing. The export of coco-nuts is small in comparison with the acreage under cultivation, both for the above reason and because the major portion of the nuts is utilized in the colony in the manufacture of coco-nut oil and cattle food. There is a large consumption of coco-nut oil, especially among the East Indian section of the community, and the locally prepared product has gradually replaced the imported kinds of coco-nut oil.

EXPORT OF NUTS.

The export of coco-nuts during 1914-15 was 1,890,000 as against 872,000 in the previous year. The following table shows the average annual exports for quinquennial periods since 1892:—

Periods.	Average Annual Exports.
1892-6	80,374 nuts
1897-1901	21,892 ,,
1902-6	187,305 ,,
1907-11	526,901 ,,
1912-14 (3 years only)	1,427,644 ,,

A small quantity of copra was made in the colony during the year, the export being 1,690 cwt.

Better attention is being paid to the proper spacing of the plants, but the necessity for proper drainage is frequently overlooked.

YIELD OF NUTS.

Most of the varieties raised at the Botanic Gardens from imported and from selected local nuts are now bearing, and the seed is being distributed for planting purposes. Five hundred and sixty-nine nuts were distributed during the year, the number being made up as follows:—

Origin of trees.	No. of nuts distributed.
From trees grown from Singapore nuts	187
,, ,, ,, ,, Trinidad nuts	56
,, ,, ,, ,, Tobago nuts	207
,, ,, ,, ,, Selected local nuts	119
Total	569

The following returns giving the average number of nuts per tree occurring on some of the trees growing at the Experimental Fields, Botanic Gardens, are of interest:—

Origin of trees.	No. of trees.	Average No. of nuts per tree.
Trees raised from Singapore nuts	7	123
,, ,, ,, selected local nuts	5	91
,, ,, ,, Tobago nuts	4	82
,, ,, ,, Trinidad nuts	3	56

(*Journal of the Board of Agriculture of British Guiana* for May 1916.)

The effect of water in the ration, on the composition of milk in the cow, is dealt with in the *Journal of Agricultural Research* for April 24, 1916. In the experiments described, certain individual cows at times produced milk having an abnormal fat content. This effect was apparently independent of the ration as it occurred not only with the high water content ration, but with the dry as well. A study of the data obtained in the four series shows that the watery character of the rations has no effect upon the fat content of the milk. There was even less variation in the other milk constituents than in the fat. This indicates that rations of varying water content have no effect upon the composition of milk.

AN ADDRESS BEFORE THE ST. LUCIA AGRICULTURAL AND COMMERCIAL SOCIETY.

Before a well attended meeting of the St. Lucia Agricultural and Commercial Society held in June 1916, at which His Honour the Administrator of the Colony presided, an address was delivered concerning the agricultural position of the Colony by the Imperial Commissioner of Agriculture, Dr. Francis Watts, C.M.G. In the course of his introductory remarks, Dr. Watts said that agricultural progress and development in St. Lucia have been subjected to conditions differing in many ways from those of other West Indian islands; in consequence agriculture, at times, has appeared to suffer some eclipse, and to occupy a less prominent part in the Colony's affairs than circumstances seemed to warrant.

Dealing with events of comparatively recent times, Dr. Watts said it would be interesting to take a brief survey of them. Formerly sugar played an important part in the agriculture of the Colony, but this industry suffered in common with that of the whole of the West Indies, in the disastrous period of the early eighties.

At this crisis the Colony wisely turned attention to the creation of other interests, and efforts were made to utilize the harbour and to establish a Coaling Station. How successful this has been, and what benefit has accrued to the Colony, was well known. But naturally, while this effort was being made, attention was diverted from agriculture, and this diversion was accentuated by the state of the sugar industry.

Soon after this, another set of circumstances further diverted the popular mind from agriculture: this was the placing of a garrison in the Colony and the construction of great works for the accommodation of very large numbers of troops. While this brought much money to the island and helped the development of the harbour and coaling stations, it retarded agricultural progress, though agriculture still remained to the Colony as a partially developed asset. Consequently, when in 1902 there came a change of policy as regards the garrison, and work was stopped and troops withdrawn, attention began to turn to this partly developed asset, and an expansion of agriculture was deemed to be a wise policy.

St Lucia is fortunate, Dr. Watts went on to say, in that it possesses these diverse interests, and it is wise to exploit to the full the advantages offered by its position on the world's trade route, its harbour and its coal depôts. These interests should be fostered and developed by all reasonable means. But St. Lucia would be unwise to neglect its agricultural assets, and that aspect appears to be generally admitted to-day. He thought, therefore, that a brief survey of these assets, and the progress made in the direction of realizing them, might profitably occupy a short time at the present meeting.

Dealing first with sugar, it was pointed out that this is the old agricultural industry of the Colony. At the time of the great depression, St. Lucia, instead of turning to other crops as did Grenada and Montserrat, introduced more efficient machinery and a Usine system. Many mistakes were made in this connexion and much money was wasted: nevertheless, when the muscovado industry of neighbouring islands fell into decay and practically ceased, St. Lucia still preserved the sugar industry, which may prove capable of valuable and useful expansion in the changed circumstances of the near future.

In the Colony there is a large area of suitable land for sugar cultivation, consisting of level valleys possessing a good rainfall. The industry is concentrated in hands capable of directing its policy, and so it is unnecessary to discuss details of the policy that may wisely be adopted.

Turning to the cacao crop, Dr. Watts said that under the stress of the misfortunes of the sugar industry, the neighbouring colony of Grenada devoted special attention to cacao planting and, as a result, has become quickly prosperous. To some extent, St. Lucia did the same, but other interests diverted to a considerable extent thought, energy, and capital from agriculture. Cacao made some fair development in St. Lucia, but not to the full extent possible.

Dr. Watts then went on to discuss the progress of the cacao industry as manifested by the export figures in a large diagram illustrating in an interesting manner the progress of the industry. The preliminary effort to develop the industry was due, as already stated, to the sugar crisis. The rapid growth of the industry indicated by the figures for the next few years was greatly assisted by the work of the agricultural officers under the direction of the Imperial Department of Agriculture, which had been established a year or two previously. In this connexion special mention should be made of the work of the Agricultural Instructor during the years referred to, and to the help derived from the Government nurseries. He thought the cacao industry was still deserving of attention in St. Lucia, but only favourable places should be established in this crop. At the present time there is a much better knowledge existing of the pests and diseases of cacao and their control, which removes a factor which has for many years interfered with a rapid extension of this cultivation. More attention might be turned in St. Lucia to the employment of grafted cacao, and to the curing of cacao, particularly that produced by the peasants.

Proceeding to consider lime cultivation, Dr. Watts said that somewhere in the early years of the present century local cultivators began to give serious consideration to limes, as a result of the success that had attended this industry in Dominica. For several years past there had been a large demand for lime plants from the Experiment Station, and many thousands have been distributed. The export of lime products in terms of barrels of limes was in 1914, 12 765, while in 1915, the export was 21,363. These figures may be taken as the equivalent of 180 acres and 300 acres, respectively, of well cultivated lime fields. Dr. Watts said that the Agricultural Superintendent had expressed disappointment at the results of planting, for very much larger areas than these have been planted and should be in bearing. But he thought that the results have not been so unsatisfactory, considering the industry was a new one, and experience has to be gained to show to what extent care and cultivation are necessary.

The Government lime juice factory has proved a great success. In 1914-15 it dealt with 2,125 barrels of limes supplied by 728 vendors; in 1915-16, 3,618 barrels of limes supplied by 904 vendors. Dr. Watts said it was interesting to observe that the greater number of these vendors were small growers situated in the Castries district and Gros Islet district, which is a a self-contained area running from Castries along the Leeward Coast to the north of the island. It was important to realize that there were some 750 centres of individual effort, and each was capable of extending its cultivation to a small extent, but to an extent which when taken altogether would mean a big increase in the total area under lime cultivation Other centres capable of development are to be found in the Soufrière district, the Micoud Heights, and in the Dennery Quarter. In connexion with this, Dr. Watts called attention to the need for more

agricultural instructors for visiting the cultivations and advising in connexion therewith. Returning to the subject of the factory, this may be regarded as a sound business investment, while it has several indirect effects of great value in that it encourages the development of the industry, and is of importance as a model for the estates. The factory is being enlarged to double its previous capacity.

Concerning coco-nuts, Dr. Watts saw considerable possibilities, but there is great need for care and manuring in the early stages. The coco-nut is a plant without branching habits, and a great deal depends upon making conditions of growth favourable during its development from the seedling to maturity. The same care is not so vital in the case of branching crops like limes and cacao. There are many places around the coast of St. Lucia, and also some inland areas very suitable for coco-nut cultivation.

The last subject dealt with in this address was the activities at the Government estate, Réunion, where there exists a Land Settlement and an Agricultural Station. Three years ago Réunion estate was taken over by the Government in practically a derelict condition, but now by proper management it is in a very satisfactory state indeed. Its value lies in several directions. It has helped in the development of a district; it has led to the inculcation of sound methods; it has increased the demand for land by the peasants; and has led to varied improvements. The development of Réunion has infused a healthy tone into the lives of the peasantry, and has been a sound investment from a strictly commercial point of view. It has given a new district to St. Lucia. The Land Settlement in particular has been a very great success; thirty-six lots have already been sold, and the keenness to acquire more land amongst the occupiers exerts a useful stimulus to make occupiers pay up their money in good time. The Agricultural Station itself is of great practical value even from the point of view of the plants raised for distribution; but this by no means comprises all the useful work done. In connexion with land settlement and the peasants, Dr. Watts referred to the co-operative credit society movement. Societies have been formed in Soufrière, Choiseul, Micoud, and Dennery, and it would appear that this effort should develop and spread.

In conclusion, Dr. Watts drew attention to and emphasized the importance of what he termed the community effort. There is ample evidence of individual activity in pressing forward agricultural developments in St. Lucia, but it is quite possible for individual efforts to manifest themselves in diverse and sometimes even in opposing directions. For a colony to make progress in the best and most economical manner it is necessary to develop common aims, and to create bonds of thought on community lines: this may well be the function of such bodies as the Agricultural and Commercial Society. Frequent meetings to deliberate concerning matters which are of general welfare will tend to keep alive those interests which the members of the community should share in common; while stimulating individual efforts, this will direct them to common ends for the general welfare.

Soundness of ideas in this connexion will greatly facilitate the work of the Government and of the Agricultural Department, and will lead to the provision of proper facilities for doing the work required, just demands concerning the work to be done, and proper and critical appreciation of what is effected.

THE SOIL-BALANCE OF HUMUS AND WATER.

The following extract, containing instructive considerations applicable to West Indian conditions, is taken from an address on cultivation and cover crops, published in the *Monthly Bulletin of State Commission of Horticulture*, of California, for May 1916 :—

Cultivation, meaning the stirring of a soil to accomplish aeration and to prevent evaporation, is a practice which has been in vogue among agriculturists since the beginning of agriculture. Under the semi-arid conditions of the south-west, cultivation has assumed a more important rôle than in most of the sections of this country. Water has, in reality, been the limiting factor with most of the cultivated land. Thus certain cultivation was necessary to conserve this valuable element. Investigations carried on some little time ago showed that cultivations to a depth of 4 to 6 inches materially lessened the evaporation of soil moisture, and in this regard were much superior to shallow cultivation, such as is adapted to eastern humid conditions.

Cultivation, in that it aerates the soil, tends to increase the oxidation of organic material. The high temperatures met with during the summer months in this State also make for the increase in the oxidation process. Thus, in the conservation of water the excessive cultivation has caused a considerable loss of organic material in many of our soils. In fact, there are many who believe that the loss of organic material by such frequent cultivation, is more serious than the loss of water caused by systems employing less frequent cultivations. As with all things, we usually find a happy medium, which is better than going to either extreme. Too frequent cultivation is extremely exhaustive of organic material; too infrequent is just as exhaustive of the irrigation water. The type of soil, the location and the crop will all have a bearing on the frequence and depth of cultivation. In the heavier types of soil, cultivations are usually more frequent, while the lighter soils are frequently well protected from evaporation by a single cultivation after each irrigation.

Cattle Spraying in Antigua.—A correspondent in Antigua writes to say that the spraying of cattle has now become general in that island. It can be safely said that 90 per cent. of the estates employ this treatment regularly. Peasant proprietors, owning one or two head of cattle, have not yet started to use it, but these small stock-owners are better able to control ticks by close personal attention to their animals.

The regular use of a dip for spraying is not only found to keep the cattle free from ticks, lice, etc., but it is also found to be a reliable preventive against various diseases known as skin disease, mange, etc. Moreover, as a result of spraying, the animals improve in general physical condition, are better able to work, and they increase in value.

The smaller estates use the ordinary bucket pump for spraying purposes, but a regular dipping tank for the cost of which Messrs. Cooper & Nephews contributed £25, has been built on one large estate, and has been found to be very successful. The cattle readily become accustomed to walking through the tanks, and the process gives the minimum of trouble to all concerned.

Another large group of estates has a large spraying machine which has been very successfully used for some years now, and another large property proposes to instal a similar spraying machine in the near future.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

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All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number has regard to the spread of economic effort within the West Indies, and shows how general schemes now in operation have developed from restricted activity in one or two individual islands.

On pages 246 and 247 will be found an instructive address delivered before the St. Lucia Agricultural and Commercial Society recently, by the Imperial Commissioner of Agriculture for the West Indies.

An important article dealing with the true and the false Bay tree appears on page 243.

The poisoning of weeds and trees is dealt with in an article on page 254.

The American Papaw and the Tropical Papaya.

According to the *Journal of Heredity* for July 1916, the American papaw is known botanically under the name of *Asimina triloba*, belonging to the family Anonaceae, which includes the custard apple. It is stated that so little is the papaw known that its very name has been stolen from it and applied, through a confusion in sound, to the tropical papaya (*Carica Papaya*). While this double use of the term is unfortunate, we fear that as its employment in connexion with *Carica Papaya* is world-wide, there is little chance of even the United States ever gaining a monopoly of its use in connexion with their northern species of fruit.

The article in question gives an interesting account of the papaw tree, which, in appearance, resembles very much a cacao tree. But the papaw thrives under temperate conditions, and is not in any sense a tropical plant, though many of its near relatives are. One of the promising fields for plant breeding, in connexion with the papaw, appears to be in hybridizing it with its close relatives, the tropical anonas—the soursop and the custard apple, for instance. These fruits are larger and finer than the papaw, but too tender to grow in the United States except in Southern California and Southern Florida. There would appear to be a good chance that they could be crossed with the papaw, and the fruit produced which would be hardy in a large part of the United States, while superior in quality to the papaw itself. So far as is recorded, this cross has never been made.

The above idea of extending the range of a tropical plant by crossing it with its near relatives in a cold country is new and interesting, and there would seem to be no reason why the reverse could not be effected, and some of the more attractive fruit of temperate countries acclimatized by hybridization to grow in the tropics.

A Plea for Greater Uniformity of Method.

The editorial in this Journal for May 6 of this year, showed the great lack of uniformity that exists in the West Indies with regard to methods adopted in the carrying out of manurial experiments with trees. The methods of carrying out, and of interpreting the result of experiments with both cacao and coco-nuts in Demerara, Trinidad, Dominica, and Nevis were compared, and the conclusion arrived at was to the effect that no surprise need be felt concerning the conflicting results obtained, considering the absence of uniformity in the methods used for obtaining them.

This is much to be regretted in the case of cacao especially. With crops like sugar-cane, and with coco-nuts to a lesser extent, the results of experiments in different places will always tend to disagree no matter how uniform the method, because of the wide range of conditions under which these crops will thrive. But with a crop like cacao it is different. Cacao thrives

well only under a very restricted range of conditions—plenty of humidity and shelter, and a fertile and well-drained soil being essential. Therefore it ought to be possible to obtain results in one place which are more or less applicable to another. This could hardly be expected with sugar-cane, for instance, which has to grow in shallow soil in Barbados with a rainfall of, say, 45 inches. in the teeth of a drying trade wind on the one hand, and in a deep alluvial soil under conditions of extreme moisture in British Guiana, on the other. But as nas been pointed out, in the case of cacao it is different; and similar observations apply in the case of limes and rubber. In regard to manurial and other plot experiments conducted with such crops as these, there is good reason to believe that it would be found that results of wide application would be obtained if an effort were made to employ uniform methods of experimentation.

Land Settlement in Jamaica.

Rules as to sale of lands by the Government of Jamaica to settlers are published in the *Jamaica Gazette* for March 16, 1916. These provide firstly for the appointment of a Land Board in each parish in which the Government owns sufficient Crown lands to justify its creation, and the duties of such Board shall be to consider and advise the Government as to the best means of opening up Crown lands for settlement, and as to the methods of providing means for making and maintaining roads into such Crown lands.

They provide further that no more than 300 acres will be granted to one purchaser nor less than 5 acres, except in cases specially approved by the Governor, nor shall any two grants of 300 acres be allotted to run continuously and contiguously without such approval. As far as practicable, the Governor will adopt the general principle that out of every block, say, of 1,000 acres, not more than one block of 300 acres should be sold. The value of land to be sold will be fixed by the Surveyor General in consultation with the local Land Board with the approval of the Governor. Each applicant for the purchase of land must submit a recommendation from a person of good standing to whom he is personally known. On deposit of one-fifth of the price of the land, the Surveyor General is required to cause a survey to be made of the quantity of land applied for, and possession will not be allowed to any applicant till a survey has been made defining the lot purchased. The remaining four-fifths of the purchase money are made payable in ten years by ten equal yearly instalments. Provision is made, however, that if within a period of ten years the purchaser shall have established one-fifth of his acreage in coffee, coco-nuts, cacao, oranges, or other permanent crop-producing plants, and shall have erected and maintained on the land a suitable dwelling house to the approval of the Surveyor General, he shall be released from payment of, or be refunded as the case may require, one-fifth of the purchase money. Provision is also made for reservations in the conveyance from the Crown, including among others, reservation to the Government of the right to make railways and new roads,and reservation of all mines, minerals and mineral oils whatsoever as are situate and lying either above or beneath in or under the said land, and of prospecting for mines, minerals and mineral oils; also reservations to lay water pipes, and to construct and operate telegraph and telephone lines, and to take and use free of cost water on the said land for public water-supplies, etc., the Government paying the cost of any damage actually done to fruit trees, growing crops, or cultivated ground, in carrying out any such works.

The Recent Trade of Foreign Countries and British Possessions.

As might be expected in view of the war, extraordinary changes have taken place in regard to the imports and exports of merchandise for different countries during the past two years. *The Board of Trade Journal* for March 30, 1916, contains summary tables giving particulars as to the total value of the exports and imports for 1913, 1914, 1915. In the case of the United Kingdom, for instance, the value of the imports rose from £601,161,000 in 1914 to £754,327,000 in 1915, while the exports fell from £525,245,000 in 1913 to £384,647,000 in 1915. Canada's imports have decreased, on the other hand, while her exports have risen to the extent of from £77,966,000 in 1914 to £126,238,000 in 1915. This remarkable expansion is no doubt directly attributable to the increased demand for materials by England and France on account of war. The exports of the United States have risen from £431,470,000 in 1914 to the enormous figure of £726,253,000 in 1915, and this year (1916) no doubt this figure is still higher. It is hardly necessary to mention that the value of the United States exports is vastly higher than that of any other country in the world, and it indicates how great her commercial power will be in the period subsequent to the end of the war. It is satisfactory, however, to see the higher *percentage* or *relative* increase in the case of Canada, which indicates the great industrial development that the war has stimulated in this part of the British Empire. It is satisfactory, too, to notice that India and Egypt, though their trades have suffered, are yet maintaining a satisfactory volume in each case.

Sea Island Cotton Market.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 24, 1916, with reference to the sales of West Indian Sea Island cotton:—

A fair business has been done in West Indian Sea Island since our last report, most of the sales having been delivered on the forward contract. About 200 bales have been sold, chiefly Antigua 13*d.* to 16¾*d.*, Virgin Islands 15½*d.*, St. Eustatius 13 to 16½*d.*, together with a few superior St. Kitts at 20*d.* Prices generally are firm.

INSECT NOTES.

AN INSECT DESTRUCTIVE TO STORED MAIZE.

For nearly three-fourths of a century the larva of a small moth (*Batrachedra rileyi*), commonly known as the pink corn-worm, has been observed in the fields of the Southern States, but according to Bulletin No. 363 issued by the Bureau of Entomology of the United States Department of Agriculture, it was not until 1914 that this species was recognized as a pest. Complaints have been made of the serious damage done by this insect to stored corn. It appears that the injury is occasioned by the caterpillar, which devours the interior of the grains. The caterpillar also feeds on cotton. The great increase in the numbers of this insect is said to be due probably to the destruction of cotton bolls by ploughing them under as a remedy against the boll weevil. If the insect should be introduced into the West Indies, it is probable that it might occasion much trouble. The following is a summary of the facts in the Bulletin referred to above:—

The so-called pink corn-worm is not a true worm, but the caterpillar or larva of a minute moth known as *Batrachedra rileyi*.

Attack on corn begins in the field and continues after the corn has been stored. When the stored product is husked, the infested ears show injury by accumulations of webbing and frass, or excrementitious matter. A careful inspection discloses the 'pink worm'.

The eggs are deposited in the field where the tips of the corn ears are more or less open, due to the attack of the corn ear worm. After the latter has departed the pink corn-worm continues the injury and by its work makes it easy for other insects and water to enter the ears, which eventually are ruined.

From the cob or between the rows of grains the worm penetrates the kernels at the tip or point of attachment, works into the embryo or 'germ', which it destroys, then outward to the crown.

Unlike the Angoumois grain moth and the rice weevil, which are usually to be found working in the same fields and frequently in the same ears, this 'worm' does not confine itself to the kernel, but attacks kernel, husk and cob alike.

Also unlike most other grain pests, it appears to be confined among cereals to corn and sorghum, although it attacks, but does not seriously injure, cotton bolls which are more or less open, and some other plants.

While thus far it has proved most injurious in Mississippi, it ranges from South Carolina westward to Central Texas, southward to Tropical Texas, and northward to Arkansas and Tennessee.

During the years 1914-15 the pink corn-worm was reported to have occasioned very considerable injury, and much alarm was felt because of its abundance in the regions mentioned. Previously, although known to attack corn, it has never been considered a serious enemy of grain.

Naturally it cannot be foretold when, if ever, such an outbreak will occur.

As a preventive of injury, corn should be left in the field no longer than is absolutely necessary for drying it; the husks should then be removed as soon as possible, the poorest of the infested ears destroyed promptly or fed to swine or poultry, and the best ears fumigated with carbon bisulphide.

The bins or cribs should be kept scrupulously clean, and should be fumigated before new material is stored in them.

Co-operation among corn growers of as large a territory as possible where the species occurs should be secured, that future losses may be prevented.

PROPAGATION RECIPES.

Experiments in vegetative propagation of tropical fruits have been continued at the Lamao Experiment Station in the Philippines, as the result of which 'propagation recipes' are given in the *Philippine Agricultural Review* relative to species, amongst which the following are of interest in the West Indies:—

Barbados cherry (*Malpighia glabra*). Use petioled, light gray to greenish, mature budwood; cut the buds 3·5 cm. long; age of stock at the point of insertion of the bud unimportant.

Duhat (*Eugenia jambolana*). Use barely mature, green or reddish, smooth, petioled budwood; cut the buds 4 to 4·5 cm. long; age of stock at the point of insertion of the bud unimportant.

Mangosteen (*Garcinia mangostana*). Like most other tropical fruits the mangosteen is propagated from seed. It is of course self-evident that the propagation of seedless varieties or the extension of the mangosteen season cannot be accomplished until the mangosteen can be propagated asexually. However, the mangosteen is of such exceedingly slow growth that it will probably never be chosen as a stock until all other possibilities have been exhausted.

Generally speaking, the requirements for successful grafting or budding are about the same in related plants, and in order to ascertain the ease with which *Guttiferous* plants might be shield budded, a series of buds were inserted on the Palo Maria (*Calophyllum inophyllum*). These buds, about one half of which were petioled, all made good unions and sprouted without difficulty, which indicated that related plants would likely be 'easy' subjects. A few plants of the guta-gamba (*Garcinia venulosa*) were on hand and these were also budded, and a dozen buds of this species (*Garcinia venulosa*) were also inserted in *Calophyllum inophyllum* stock. All the buds took and made perfect unions. Well-matured but green and smooth non-petioled mangosteen budwood was then procured and buds inserted both on *Garcinia venulosa* and *Calophyllum inophyllum*. Good unions resulted in most instances. Four months after the insertion of the buds, nearly all the buds of *Garcinia venulosa* and 50 per cent. of the mangosteen were still alive, but had not sprouted and are gradually being callused over.

EXPERIMENTS WITH STOCKS FOR CITRUS.

Attention is being given in several quarters to the interesting subject of the effect of the stock upon the scion. The work that has been done in this connexion in California with regard to citrus is of especial interest in the West Indies. For this reason is introduced below a short account of the results obtained, taken from Bulletin No. 267 of the University of California publications (College of Agriculture). The two stocks most commonly used in propagating citrus trees in California are the sweet and the sour orange. In addition to these, the pomelo (*Citrus decumana*) has been employed to some extent, as has also *Citrus trifoliata*. The

rough lemon (*Citrus limonum*), and the lime are practically unknown as stocks in California; but it is stated in the Bulletin referred to, that a more extended trial and careful study of these lesser used stocks are greatly needed. Tables are given showing the average yields of fruit, and the average volumes of the trees. This latter measurement is taken as an index of the tree's vigour, and might be similarly employed in the case of manurial and other experiments in the West Indies with limes and cacao. A formula is given for finding the volume of each tree:—

$$\text{Volume in cubic feet} = \frac{c^2}{4p}\left(\frac{o}{2} - \frac{c\,(3p-4)}{12p}\right)$$

Where

c = circumference of tree,
o = distance over top of tree,
p = 3·1416.

With regard to a discussion of the results, a consideration of the table of comparative yields makes it clear that these data are purely indicative, and in no sense proper as a basis for definite conclusions. The yields indicated are in all cases extremely small, even for average values. This is of course primarily due to the fact that the figures are those of the first years' of production in the life of the trees; the very low yield of the first year or two has naturally reduced the average for the five years to a considerable degree. Allowance must also be made for the severe cold waves of December 1911 and January 1913, which may have had their effects upon the succeeding bloom and crops. This is undoubtedly true in the case of the lemon yields.

'It is evident, however, that there is no ground at present for recommending any particular stock for increased yield or quality of fruit of either of the oranges or the lemon used in these experiments. Such evidence could scarcely be expected at the end of the first half decade of an experiment the nature of which demands an accumulation of many years' data as a pre-requisite for sound conclusions. Assuming a future increased annual production consistent with the increasing age of the trees, we may properly look for more differences between the yields of trees on different stocks in the averages of the next five or ten years, if such differences are to become evident under the conditions of the experiment. Moreover, any factor making for reduction in yield or quality of fruit or in size of tree which may be associated with early growth—a characteristic accredited to sour stock for example—should disappear in the future records.

'Conclusions regarding the superiority of any one stock or its effect upon growth are likewise wholly unwarranted at present. Attention is called to the fact that the behaviour of the orange, both navel and Valencia, has varied on the two plots in regard to the size of trees on trifoliate and the other stocks, and that in no case has the use of the former effected a marked or undesirable dwarfing. Valencia has been particularly thrifty on the trifoliate root. Indeed the most striking fact of the experiment evident to date is that *Citrus trifoliata*, *per se*, does not necessarily dwarf all species or varieties budded upon it. Where such dwarfing occurs, it is highly probable that conditions of environment are largely responsible. Further and more extensive investigation of these stocks on a number of widely different soil types is essential for a final answer to this question.

'On the other hand, the dwarfing of Eureka lemon on trifoliate root has been so extreme and so consistent that we may justifiably regard it as highly undesirable for that fruit.

'A point of interest in connexion with the use of *Citrus trifoliata* as a stock is the characterstic increase of the diameter of the trunk below the bud-union. This seems to be a constant result of the union of the comparatively small root system, accustomed normally to develop a small tree, with the bud of a species of large growth. Such evident root stimulus appears in the trifoliate stock irrespective of the variety of orange or lemon budded upon it. In the case of the latter the increase of trunk persists even when the counter effect results in the dwarfing of the tree.

'It must be pointed out in conclusion that this Station, despite the favourable results so far obtained with the trifoliate orange as a stock for oranges, cannot recommend it at present, in view of the fact that well-defined cases are known where its use has been injurious. In the absence of further knowledge, with the limited data at hand, the use of either sweet or sour stock is, therefore, to be recommended on grounds of wide and successful experience of California growers. Where conditions are favourable for the development of gummosis, sour stock should be given the preference.'

Teak in Trinidad.—The following note on the growth of Teak in Trinidad has been received at Kew from Mr. C. S. Rogers, Forest Officer, Trinidad and Tobago, with some interesting photographs, showing the remarkable size of the leaves and the vigour of the young trees:—

East Indian Teak, *Tectona grandis*, was first introduced into the plantations in the Forest Reserves in Trinidad in 1913.

The seeds were obtained from the Tharawaddy, Burma, through the courtesy of the Conservator of Forests, Pegu Circle.

In 1913 about 14½ acres were planted, 2½ acres being situated in the Southern Watershed Reserve, about 7 acres in Arima Reserve, and 5 acres in the Central Range Reserve. In each locality the original forest containing no marketable timber of any consequence was felled, burnt, and lined out with stakes or pickets at 10 feet by 10 feet.

So far the best results have been attained in the Central Range Reserve Plantation where 5 acres were planted 10 feet by 10 feet. Of the 2,178 pickets thirty-five were on unplantable ground, the remaining 2,143 were sown with Teak seeds in July (18 to 24). The sowing was rather late owing to the impracticability of getting the area ready at an earlier date. In the following January (1914) 1,339 pickets, at which seeds had not yet germinated, were re-sown.

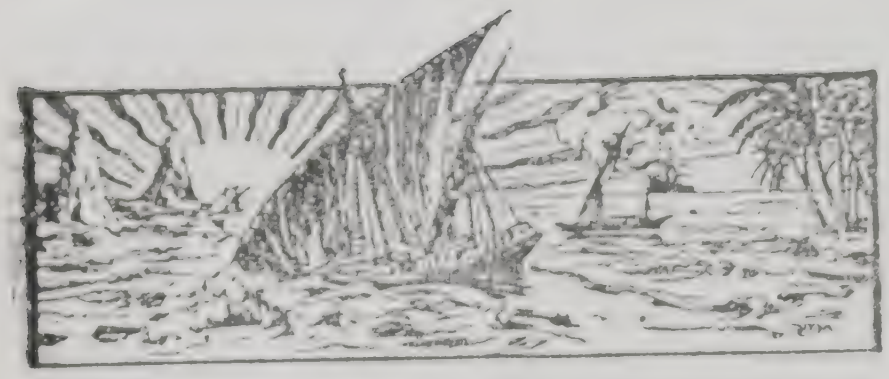
At the end of March 1914, 1,758 Teak seedlings had resulted, and some of them were 6 to 10 feet high. In the following wet season the blank pickets were again re-sown. At the end of March 1915, when stock was taken, it was found that there were only twelve blanks.

Some of the plants had attained a height of 23 feet and leaves were measured up to 36 inches in length by 25 inches in width, the Teak being then between twenty to twenty-one months old from the date of sowing the seeds.

In October 1915, a tree was measured and found to be 32 feet high with a girth of 2 feet at ground level, and 16½ inches at 3 feet, and 14½ inches at 5 feet from the ground. Its age was two years and three and a half months from date of sowing.

The soil is a sandy loam of Tertiary origin. The elevation does not exceed 1,000 feet. The original forest contained some trees of large size, but the more valuable species had been cut out, and the remainder were for the most part unsaleable owing to distance from a market.

The normal rainfall for the district is about 115 inches, but during the last two years it has been 20 per cent. below the average.



GLEANINGS.

A forecast to the maize crop of South Africa appears in *The Board of Trade Journal* for March 30, 1916. For the whole of South Africa an increase over the previous season's yields of about 62,000 bags is estimated. This is of course a negligible quantity.

A note in *Nature* for June 22 shows the large amount of potash contained in tobacco ash, namely, 20 per cent. The tobacco consumed in the United Kingdom for the year ending March 31, 1914, would give approximately 13,359 tons of ash, containing 2,672 tons of potash, which at the pre-war price of kainit would be worth nearly £51,000.

In a report on the North-western District of British Guiana, for the nine months April to December 1915, it is stated that the area under cultivation shows an increase of 187½ acres for the period, the total area cultivated being 2,046 acres. The cultivation of coffee continues to receive much attention by the farmers of this district, and the area under this crop has been increased by 140 acres.

In a report under the Food and Drugs Ordinance of British Guiana, it is stated that the low quality and high rate of adulteration of the milk offered for sale in Georgetown is very noticeable. Out of 523 samples of milk purchased in Georgetown no less than 208 were unsatisfactory in quality, whilst 131 were found to be adulterated. These figures are equivalent to 39·7 and 25·1 per cent., respectively.

The *Perfumery and Essential Oil Record* for June 1916 reviews the Dominica lime oil history on the basis of information contained in a paper on the development of Dominica, written by Dr. Francis Watts, C.M G., and published in the last issue but one of the *West Indian Bulletin*. Figures are published showing the rise in value of the exports of lime oil, which increased from £87 in 1892, to £10,138 in 1914.

The following figures represent the composition of a sample of pollard (wheat by-product) sent by Dr. R. A. Stoute, Government Veterinary Surgeon, Barbados, to the laboratory of the Louisiana Experiment Station for analysis: crude protein, 15·19 per cent.: fat, 4·80 per cent.: carbohydrates, 56·46 per cent.: crude fibre, 9·30 per cent.: water, 9·80 per cent.: ash, 4·45 per cent. This compares more or less favourably with the composition of rice bran.

An advertisement in the *Journal of the Department of Agriculture of Victoria* for January 1916, concerns channel irrigation and the prevention of seepage. The employment of open fluming as against closed piping is advocated. The material required to make 6-inch piping will make 12-inch open flumes, giving almost double the capacity, while the price is just half. This would appear to be a very satisfactory way of conducting irrigation water along level land for short distances.

At a meeting of the Board of Agriculture of British Guiana on July 11, it was stated that posters had been distributed describing common insect pests and plant diseases of the Colony; also that the demand for these posters seemed to be greater outside than in the Colony, and several applications have been received from abroad. There has been another severe outbreak of the caterpillar pest on coco-nuts on the East Coast, and the Board has instructed the Pest Committee to take the matter up.

In an article in the *London Chamber of Commerce Journal*, reviewing the occurrence in the British Empire of molybdenum ores, it is stated that specimens of minerals from an abandoned copper mine at Virgin Gorda, Virgin Islands, were examined at the Imperial Institute in 1907, and found to contain molybdenite and molybdenum oxide. One sample represented material which would be worth concentrating if large supplies of the ore were available for treatment.

An extension of corn cultivation is advocated for Jamaica, in the *Journal of the Agricultural Society* of that Colony. It is stated that the average value of the imports of corn meal for the last four years was over £50,000. Further, between corn and corn meal imported during the last four years, Jamaica averaged an expenditure of £100,000 in cash. The only advantage the imported corn meal has, is its good keeping qualities. It appears that the erection of a kiln-drier and degerminator has not yet been considered for Jamaica.

The suggestion of central distillation of Bay oil in Montserrat, made by Dr. H. A. Tempany and Mr. W. Robson in the last issue but one of the *West Indian Bulletin*, is supported editorially in the *Perfumery and Essential Oil Record* June 1916). That journal states: 'Central production under scientific control would very materially advance us towards that standardization of Bay oil which is one of the conditions precedent to its enjoyment of the confidence of manufacturers of perfume and its wider adoption in compound odours.'

The storm damage occasioned by the West Indian hurricane, which on September 29, 1915, struck New Orleans, and which blew continuously for twenty-four hours with a velocity of 50 to a maximum of 130 miles an hour, is reported on in the Fifth Biennial Report of the Board of Curators of the Louisiana State Museum for 1915. It appears that a great deal of damage was done to the Museum, and loss was sustained amounting to over $7,000. It is stated that during the heaviest blow, windows were completely blown out, and some of the window and door frames gave way inside.

TRADE AND AGRICULTURE OF JAMAICA, 1914-15.

The report on the Blue Book of Jamaica for the year 1914-15, is issued as a supplement to the *Jamaica Gazette* for December 2, 1915. From this the following interesting information as regards the trade and agriculture of that colony during the period reviewed, is abstracted.

The total exports for the year amounted in value to £2,904,533, being an increase of £474,326 over those of the previous year, while the imports decreased by £271,626, the total value being £2,565,820. The year 1914 was agriculturally prolific, and notwithstanding the handicap of war conditions and the competition in the island's principal fruit market of a phenomenally abundant crop of home-grown fruits, the domestic exports of the year actually constituted a record, having been in excess of those of 1911 by upwards of £22,000, when from the figures are eliminated the value of re-exports. The growth of the total export trade of the colony in the forty years since 1874, given in periods of ten years, is shown to be as follows:—

	£.
1874 — — —	1,442,080
1884 — — —	1,483,989
1894 — — —	2,075,689
1904 — — —	1,436,725
1914 — — —	2,904,533

Figures are also given showing the trend of trade, the markets accepting the colony's exports in each of the years specified, and the percentages falling to each, these being as follows:—

	1874, per cent.	1884, per cent.	1894, per cent.	1904, per cent.	1914, per cent.
United Kingdom	79·2	43·4	26·7	18·9	18·2
United States	1·5	31·1	57·3	53·5	60·9
Canada	·6	13·4	1·7	8·8	7·2
Other countries	18·7	12·1	14·3	18·8	13·7

Turning to agriculture, it is seen that the acreage returned in 1914-15, grouped under the four main divisions of the returns, and compared with the average of the four preceding years, produces the following:—

	1914-15. Acres.	Average 1910-14. Acres.
Tilled lands	273,111	271,316
Guinea grass	172 864	148,157
Commons	566,153	513,342
Wood and ruinate	1,114,283	1,216,256

There is thus an increase in each description of land subjected to some sort of care and culture, with consequent falling off in the area returned as being in wood and ruinate. A further classification of the tilled lands under the particular cultivation to which they are dedicated, shows that the crops and areas for 1914-15 were as follows: sugar-cane, 31,727 acres; coffee, 18,175 acres; coco-nuts, 29,731 acres; bananas, 85,854 acres; cacao, 11,081 acres; ground provisions, 63,640 acres; mixed cultivation, 28,603 acres; minor items, 4,293 acres. Compared with an average of four years 1910-14 (which is given in the report), the figures show that the cultivation of bananas, coco-nuts, and minor items is increasing at the expense of all other staples. In this connexion it is remarked that, last year (1913-14), it was recorded that the cultivation of canes, coffee and cacao was on the down grade, and the figures here given show that the downward tendency has not yet been arrested, canes showing a further decrease of 607 acres, coffee 4,694 acres, and cacao 634 acres.

It is hoped that the very strong position of sugar in the world's markets, and the favourable position of cacao, will result in much more attention being given to these products in the immediate future; but the indications are that coffee will continue to give way to fruit-growing. The great increase in the coco-nut area—12,000 acres—is attributed to the return to bearing of groves that were destroyed in the hurricane of 1903, and had to be replanted. Bananas show an increase of 3,790 acres over the average. Ground provisions show a falling off of 8,421 acres, probably due to lands being less exclusively devoted to root crops than was formerly the case; and minor items exhibit an improved acreage of 187 acres.

The exports of cacao for the year achieved a record both in quantity and value, similarly the export of coco-nuts. The Panama disease of bananas has given some cause for anxiety, owing to the difficulty in securing adequate measures of quarantine among the small owners whose fields were infected with the disease. A stringent law was therefore passed, and the staff of Inspectors has been increased so as to secure efficient control of this and other serious diseases of plants.

The various plant nurseries distributed 145,000 cacao plants during the year, mainly to small settlers. By these agencies 340,000 cacao plants have been distributed to the peasantry during the past three years.

It is recorded that the staff of the Department of Agriculture has recently been strengthened by the addition of an entomologist.

The prussic acid content of sorghum receives attention in a paper in the *Journal of Agricultural Research* for May 1916. Unhealthy sorghum plants usually contain more hydrocyanic acid than healthy ones. The unhealthy condition may be due to various causes, and it is thought possible that under such conditions, the plant produces more glucosides for the sake of the stimulating hormones in it. Adequate water-supply is usually accompanied by low, and inadequate, by high, hydrocyanic acid.

Amongst the conclusions arrived at by the officiating Imperial Agriculturist of the Agricultural Research, Pusa, India, in connexion with green manuring in India, is that the subject requires closer investigation than it has hitherto received. In particular, the place occupied by leguminous food and fodder crops in the rotation appears to require study, with a view to ascertaining to what extent fertility is kept up by their means. The whole subject of green manuring in India will be found dealt with in Bulletin No. 56 of the Agricultural Research Institute, Pusa.

The best commercial method of determining the quality of an egg is by the process of candling. This method consists in holding the egg before a bright light and looking through it towards the light. The egg should be held below the eye thus enabling the observer to note readily the size of the air cell. A Bulletin (No 353), issued by the Department of Poultry, Husbandry, of the Cornell University, contains a large amount of information on the interior qualities of eggs, and has some very fine coloured illustrations showing the candling appearance of different qualities, and the open appearance of market eggs. There appears to be a great deal of variation in the quality of individual eggs, and this subject might receive more attention in the West Indies.

PLANT DISEASES.

THE POISONING OF WEEDS AND TREES.

THE PREPARATION AND USE OF WEED-KILLER. Some valuable and detailed information on the subject of the preparation and use of sodium arsenite for the destruction of weeds is given by G. P. Gray in the Monthly Bulletin of the California State Commission of Horticulture for April 1916. The State Experiment Station is conducting an investigation as to the most suitable substances to use, the proper strength at which they should be applied, the time of year to obtain the best results, and the residual effect on the soil. A warning is given as to the indiscriminate and careless use of home-made and proprietary weed killers, which are usually dangerous arsenical poisons. The usual basis of weed-killers is sodium arsenite, prepared by dissolving white arsenic (arsenic trioxide)in water containing washing soda, soda ash, or caustic soda. In the case of the two substances first named it is necessary to boil the mixture to dissolve the arsenic. The proportions of the solvent to the arsenic are given as 2 to 1 in the case of washing soda, 1 to 1 in the case of soda ash, and 1 to 2 in the case of caustic soda. A formula is given for using washing soda as follows:—

Washing soda	2 lb.
White arsenic	1 lb.
Water	1 gallon.

It is suggested that this stock solution should be diluted to 20 or 25 gallons for use, but the actual strength required for any particular purpose must be determined by experiment.

From a list of cautions necessary in dealing with these substances, the following are quoted:—

Dont handle or use arsenicals without familiarizing yourself with their properties and behaviour.
Dont purchase arsenicals without a reliable guarantee of the percentage of arsenic.
Dont use too small a vessel for dissolving arsenic.
Dont inhale the steam from boiling arsenicals.
Dont breathe any of the fumes if any arsenical is accidently spilled upon a hot stove or into a fire.
Dont boil water, sugar and white arsenic with any of the solvents for arsenic.
Dont breathe any of the dust caused by handling powdered arsenicals.
Dont make large quantities of stock solution in a closed room.
Dont splash the solutions.
Dont spray plants with poisons without taking precautions that they will not be eaten by live stock.
Dont breathe the smoke when burning plants which have been treated.

The application of the solution may be made by sprinkling or by spraying, but the latter is very much preferable. It may be used either to kill noxious weeds outright or to prevent them when growing in waste places from seeding and thus infesting adjacent cultivated land. In some cases sufficient poison may be absorbed by the leaves and stems to kill the roots to a depth of several feet.

THE KILLING OF TREES. One meets rather frequently with an enquiry as to the best means of killing a tree which for some reason is wanted out of the way. With the species most tenacious of life the operation is not so easy as is commonly thought. The common method adopted is ringing—the removal of a broad ring of bark or of bark and sap wood. The result depends on the nature of the tree, and is often disappointing. The removal of a ring of bark, provided that a connexion is not allowed to reform, prevents the passage of food materials elaborated in the leaves to the roots. If no suckers are allowed to develop below the ring, the roots eventually die of starvation, but this may be a very slow process. The course of the water passing upward to the leaves is not interfered with, so that the top remains green and healthy until the roots die. When a ring of sap-wood is removed as well, the water-supply in the case of those trees with a well-defined heart wood is interrupted, and in this event the top quickly dies. With some other trees, where there is no distinct formation of heart-wood, even this method fails to bring about an early result. Large mango trees, for example, which it was wished to eliminate from cacao cultivations, have been seen to live for years after being thus treated.

A writer in the *Agricultural Gazette* of New South Wales for March 1916, reports very successful results from the poisoning of trees with the arsenical solution discussed above, used at a strength which may be obtained by adding 1½ gallons of water to the stock solution of which the preparation has been described. A ring of downward cuts was made low down on the trunk in such a manner as to leave a frill, and into this the liquid was poured with a watering can made with a long spout and a small exit hole. It is necessary to do this immediately, while the cut is quite fresh, to prevent the blocking of the pores in the wood with air or exuded matter. It is reported that timber thus treated all died, and mostly within forty-eight hours from the time of ringing.

W. N.

Substitutes for Lemonade.—Always appreciated in a warm climate, lemonade or limeade, or similar drinks from other citrus fruits are not everywhere obtainable, but good substitutes may be produced from the fruits of certain other trees and plants. Quite accidentally it was found recently that an excellent beverage, which we may call mangoade, can be made from immature mangoes, and that it is quite equal to lemonade in its refreshing qualities, though of course, differing in flavour. Mangoade is prepared thus: peel, slice, and rinse unripe mangoes, and boil in enough water to cover the fruit; strain the mass through a fine cloth and cool; when serving, add sugar and water to taste.

By planting seed from time to time throughout the year rosellade may be had at a very slight expense at all times of the year.

Rosellade is made as follows: cut the leaves and tender stems, rinse, and put in a kettle with enough water to cover the herbage after it is wilted, bring to a boil, strain and cool. Serve as mangoade.

In both cases great care should be taken to boil and keep the liquids in earthern, granite, enamelled ware or glass in order to avoid poisoning caused by the contact of the strong fruit acids with metals.

Ripe tamarinds may be made into a delicious cooling drink that is unsurpassed in flavour, and also they make unsually well-flavoured jelly. (*Philippine Agricultural Review.*)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of June:—

The month of June opened in the Produce Markets with a quiet tone and a slow demand for produce generally, especially for those products that come under our monthly survey, Jamaica ginger and sarsaparilla being, perhaps, the most notable exceptions. As is usually the case, towards the end of the first half-year a much quieter tone prevailed, both in demand and in prices realized, as the following details will show. As the first auction was held on the 1st of the month and the last on the 29th, a period of five weeks comes under review—a sufficiently long period to cause radical changes both in supply and demand.

GINGER.

At the first auction ginger was in good demand. Some 8 bags of new crop Jamaica were disposed of, good middling fetching 115*s*., and good common 105*s*. to 107*s*. 6*d*. per cwt. One hundred and sixteen bags of Cochin were also offered, and 16 sold at 40*s*. for wormy. The rest were all bought in 47*s*. 6*d*. for sound plump. A fortnight later, namely, on the 15th of the month, the offerings amounted to 16 cases of Calicut, partly wormy unassorted, native cut, which were sold at 56*s*. Some 600 bags of washed brown Calicut were also offered, and bought in at 52*s*. 6*d*. Washed Cochin and wormy Cochin were further offered, and bought in at 47*s*. and 43*s*. per cwt., respectively. Towards the end of the month the quotations were as follows: good new crop Jamaica, 120*s*. to 130*s*.; medium, 110*s*. to 115*s*.; and common 90*s*. to 100*s*. Some 200 bags of Japan were offered and sold without reserve at 32*s*. to 34*s*.

NUTMEGS, MACE AND PIMENTO.

At auction on the 28th, nutmegs were represented by 52 packages of West Indian, all of which were disposed of at from $9\frac{1}{2}d$. to 1*s*. At the same auction, 160 packages of mace were offered and sold at from 1*s*. 5*d*. to 1*s*. 11*d*. per lb. In pimento there has been a drop in price since last month. At the beginning of June $3\frac{3}{16}d$. per lb. was quoted, and at auction on the 14th, 304 bags were offered and bought in at from $3\frac{1}{8}d$. to $3\frac{1}{4}d$. per lb.

SARSAPARILLA.

At the beginning of the month grey Jamaica was reported to be scarce. None was offered at auction on the first of the month; but of Lima-Jamaica there were 35 bales, 25 of which sold, somewhat mouldy to fair fetching 1*s*. 5*d*. to 1*s*. 7*d*. per lb., while of native Jamaica only 9 bales were offered, and all sold at prices varying from 1*s*. 1*d*. for fair red, and 1*s*. for dull red mixed. Thirteen bales of Honduras were also offered, and all sold at prices varying from 1*s*. 7*d*. to 1*s*. 8*d*. per lb. for woody to good, and 1*s*. 7*d*. for slightly mouldy. At the last auction on June 29, the offerings were as follows: native Jamaica, 25 bales offered and 7 sold; Lima-Jamaica, 24 offered and 8 sold; Mexican, 25 offered and none sold. Of the 7 bales of native Jamaica disposed of, 11*d*. to 1*s*. per lb. was paid for fair red, and 9*d*. to 10*d*. for ordinary palish. For the 8 bales of Lima-Jamaica, 1*s*. 3*d*. to 1*s*. 5*d*. was paid for more or less mouldy and 1*s*. 7*d*. for fair.

CITRIC ACID, CASHEW NUTS, KOLA, TAMARINDS, ARROWROOT, LIME OIL, AND ANNATTO SEED.

At the beginning of the month citric acid was steady at 3*s*. 9*d*. per lb. At the first auction 12 cases were offered, but none sold; a week later the price had dropped to 3*s*. 8*d*., and at the close of the month it stood at from 3*s*. 8*d*. to 3*s*. 9*d*. At the first sale cashew nuts were offered in great abundance, no less than 393 packages being brought forward, but none found buyers. At the last auction however, on the 29th, when 151 packages were offered, two were sold at 32*s*. per cwt. for very husky Bombay. Kola has much advanced in price during the past few weeks, in consequence, it is said, of an increased continental demand. At auction on the 1st of the month, as many as 94 packages were offered, and sold at the following rates: West Indian, of which 5 bags were sold, fetched from $5\frac{1}{2}d$. for slightly mouldy, to $6\frac{1}{4}d$. for fair dark halves; dark Java halves fetched from 6*d*. to $6\frac{1}{2}d$., and small $4\frac{1}{2}d$. At the last auction on the 29th, kola was again represented by 13 packages, all of which were disposed of, 1 bag of bright, bold West Indian washed, fetched $5\frac{3}{4}d$. per lb., while 12 bags of good bold Ceylon halves, realized 6*d*. per lb. At auction on the 22nd, a consignment of new crop West Indian tamarinds were offered, 24*s*. being paid for Antigua, and 29*s*. for Barbados. In the middle of the month good manufacturing St. Vincent arrowroot was sold at $3\frac{1}{4}d$. per lb. Towards the end of the month, West Indian distilled oil of lime was quoted at 8*s*. 6*d*. per lb., and 9*s*. for hand pressed. At auction on the 29th of the month, 25 bags of annatto seeds were offered, and 20 sold at 8*d*. per lb.

The Antigua Central Sugar Factory.—Dr. Watts's review of ten years' work of this Government-aided enterprise is dealt with at considerable length in an article in the *International Sugar Journal* for May 1916. It is stated that the conclusion that financially the concern must be regarded as being in a strong position, and that it demonstrates that a well-managed sugar-cane factory, working on profit-sharing lines, is a safe and remunerative colonial investment, even in times of low prices, provided an adequate supply of canes is available, is very opportune, in view of the fact that the prospects of the sugar-growing colonies after the war will be much brighter, as a result of the changed opinion at home in regard to the Empire. The article in question goes on to say that, while hardly comparing in size with the enormous factories to be found in the American possessions and in Cuba, this Antigua Central may be considered mechanically a very well equipped one, and thoroughly representative of the best British practice for a moderate output of sugar. In considering the financial side of the concern, it is noted that, after the redemption of the Debenture capital, there are to be issued to the contracting estate proprietors shares in the factory equal in number and value to the original shares in the company, and it is remarked that it must be frankly admitted that both the contracting proprietors and the investing capitalists have been extremely well looked after.

MARKET REPORTS.

London.—The West India Committee Circular, June 15, 1916.

Arrowroot—2¾*d.* to 3*d.*
Balata—Sheet, 3*s.* 2*d.* to 3*s.* 4*d.*, block 2*s.* 6¼*d.*
Beeswax—No quotations.
Cacao—Trinidad, 87/- to 89/-; Grenada, 82/- to 85/-; Jamaica, 77/- to 84/-.
Coffee—Jamaica, no quotations.
Copra—£32.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 105/- to 115/-.
Isinglass—No quotations.
Honey—45/6. to 63/-.
Lime Juice—Raw, 2/10½ to 3/1½; concentrated, no quotations; Otto of limes (hand-pressed), 9/-.
Logwood—No quotations.
Mace—7*d.* to 3*s.*
Nutmegs—9*d.* to 1*s.* 2*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/9; fine soft, 2/6½; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c. Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 1. 1916.

Cacao—Venezuelan, $15·00; Trinidad, no quotations.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$6·00 to $6·50 per 100 lb.
Dhal—$7·00 to $7·75.
Onions—$5·00 to $5·50 per 100 lb.
Peas, Split—$11·00 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·25 to $7·75; White., $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., July 12, 1916; T. S. Garraway & Co., July 11, 1916

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·00 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao [illegible] quotations; Sulphate of ammonia, $105·00 to $110·0 per ton.
Molasses—No quotations.
Onions—$5·00.
Peas, Split—$11·50 per 210 lb.; Canada, $6·00 per 120 l
Potatoes—Nova Scotia, $3·50 per 160 lb.
Rice—Ballam, $7·25 to $7·38 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·50.

British Guiana.—Messrs. Wieting & Richter, June 30, 1916; Messrs. Sandbach, Parker & C June 30, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	5c. per lb.
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	16c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$6·75 to $7·00	$7·50 to $7·7
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	7c.	$9·00 to $10·0
Madeira	——	——
Peas—Split	$12·00 to $12·50	$12·00 to 13·0 per bag. (210 lb
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	——	$4·80 to $5·0
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·40	——
Rice—Ballam	$6·75 to $7·00	——
Creole	——	$6·75 to $7·00
Tannias—	$2·40	——
Yams—White	$2·64	——
Buck	$2·64	——
Sugar—Dark crystals	$4·50 to $5·00	$4·50 to $4·00
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. p cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·0 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Trade Products of the British Empire.

IMPORTANT steps have been taken since the outbreak of war, two years ago, towards the promotion of inter-Imperial trade, the objects being to strengthen the economic independence of the Empire, and permanently to arrest exploitation by enemy countries.

Of special interest in connexion with this movement is the annual publication of the London Chamber of Commerce, entitled 'Trade Products of the British Empire', which is a statistical account of the resources of the British Empire as a supplier of foodstuffs and of raw materials for British industries, as well as being an account of foreign sources of supply.

During the last few months certain products have become especially prominent in connexion with discussions which have taken place with a view to safeguarding Imperial trade interests. The publication under consideration directs attention, in this connexion, to the case of metals, oil seeds, and sugar. Arrangements have been completed whereby the zinc production of Australia shall in future be under British control, instead of being exploited by Germany. With regard to oil seeds, an export duty of £2 per ton is to be imposed on palm kernels shipped from the British West African colonies, unless the oil is to be extracted within the Empire. By this means it is intended that the palm kernel crushing industry, which was formerly almost a monopoly of Germany, shall be retained after the war by Great Britain or other countries of the Empire.

In regard to sugar, the means whereby the Empire's independence of German beet are to be secured have not yet been definitely formulated, but the matter is engaging the active attention of the Government. From the statistics given it would appear that, before the war Great Britain was dependent upon foreign countries for 90 per cent. of its sugar; since the war, that is during 1915, this figure has fallen to 80 per cent., which from the point of view of inter-Imperial trade does not indicate a very marked improvement in the situation. The chief difference is that now,

Great Britain is dependent upon foreign cane sugar, whereas before the war she was dependent upon foreign beet sugar. To continue to remain in such a position would, economically, be almost as dangerous as to be dependent upon foreign beet. Cuba, Java, and the South American republics are the principal sources of foreign cane sugar, and it has to be borne in mind that these countries can all produce sugar as economically, if not more so, than most sugar-producing countries within the British tropics. Hence a form of preferential tariff, which it is suggested shall be introduced, will have not a single but a dual object, namely of protecting British cane sugar from foreign cane and foreign beet, both of which can be placed on the market at a minimum cost. Thus the position is one that possesses features of difficulty.

It is satisfactory to be able to notice the very large increases in the amounts and values of the sugar imported into Great Britain during the war from Mauritius, British Guiana, and the West Indies. During 1914, British Guiana and the British West Indies sent 1,397,288 cwt., valued at £1,256,197; in 1915 these figures rose to 2,327,652 cwt., valued at £2,516,292. The increase was greater in the case of the British West Indies. During 1915, the value of the imports of sugar into Great Britain from Mauritius rose to the extremely high figure of approximately £4,000,000. A large amount of this was refined sugar. These facts tend to indicate that considerable and rapid expansion of sugar production within the Empire is possible, provided there are high prices.

Turning to cacao statistics, the publication under notice shows that the proportion of imports from British Possessions in 1915 was 60 per cent. by value. Imports into Great Britain from all sources have shown an increase in amount and value, particularly in the case of West Africa, which suffered a temporary set-back after the outbreak of war in 1914.

The imports of cotton into the United Kingdom showed a marked increase during 1915, as also did the value of this product. The proportion from British Possessions was 27 per cent. by value, of the total imports. Indian cotton shipped was less than in previous years. The United States continues to produce seven-tenths of the world's supply. The dependence of the United Kingdom on the United States in regard to the supply of cotton, sugar and tobacco—Cuba being regarded internationally as the United States—is not to be overlooked. In this connexion it is to be noted also, that a large proportion of the imports of petroleum comes from the United States, though the output from India is very considerable.

It would be impossible in the space of this article to make reference to all the interesting features connected with the statistics under review. A few further facts of general interest may, however, be briefly mentioned. Rubber production is, of course, chiefly under British control; 75 per cent. of the imports into the United Kingdom in 1915 came from British Possessions. As regards silk and indigo, it may be noted that the production of these is making rapid advances in India, where special action has been taken by the Government to increase the supply. The exports of indigo from India in 1915 were 27,306 cwt., value £896,532, as compared with 12,370 cwt., value £288,602 in 1914. In the section of the publication under notice which deals with meat products, the large increase in the quantity and value of bacon and hams imported into the United Kingdom from North America and Denmark is very noticeable, and indicates the advisability of local production as far as possible of these products in other places.

Concerning miscellaneous products, reference at some length is made to the production of sponges. The demand for these, especially for those used in the arts and industries, is stated to be constantly increasing and exceeds the supply. The United Kingdom obtains her chief supply from the Mediterranean—principally Greece—though a fair quantity comes from Florida and the Bahamas. The desirability of laying down cultivated sponge beds is referred to, for it is well known that there are several places in the British Empire, for instance in the West Indies, where this might be satisfactorily accomplished.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture is expected to leave Barbados on August 24 for Antigua, with the object of paying an official visit to that Presidency.

Mr. W. Nowell, D.I.C., Mycologist to this Department, left Barbados on August 10 by the C.R.M.S. 'Chaudiere' for Dominica, with the object of continuing certain mycological investigations in that island.

SIMPLE STILLS FOR ESSENTIAL OILS.

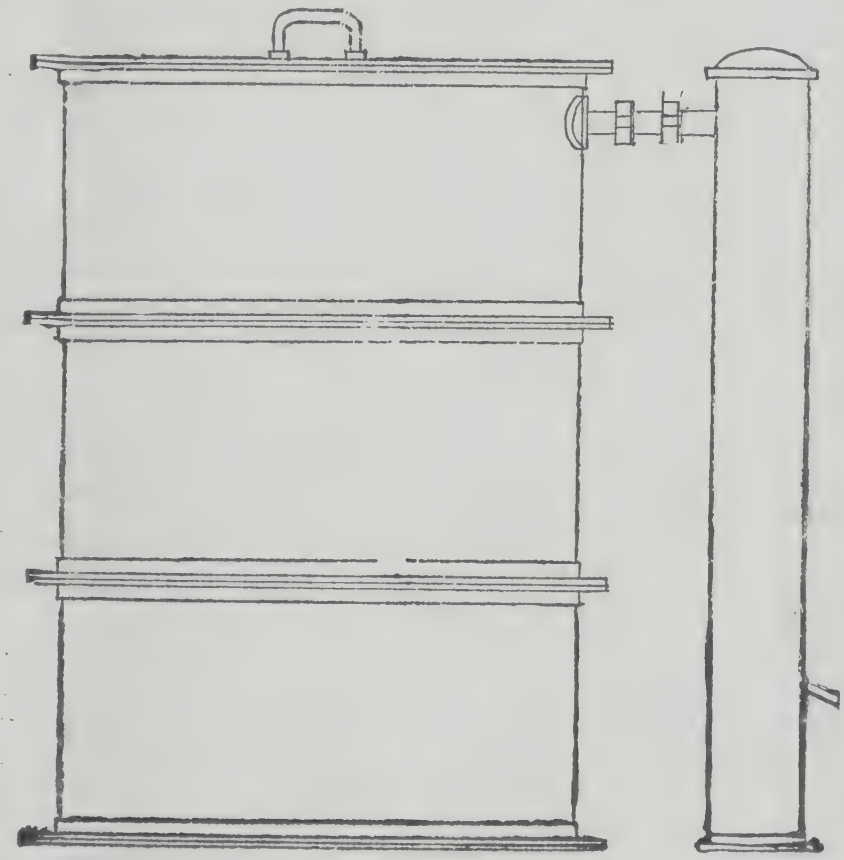
With increasing attention to the production of the essential oil of Bay leaf and other essential oils, there arises a demand for a convenient type of still. In the *West Indian Bulletin*, Vol. IX. p. 276, suggestions were made for simple stills, two forms being described. Both types have been in experimental use for a number of years. As the result of this experience it is found that the simple still of the first type there described is quite satisfactory in operation, but it has the defect that it soon corrodes and has to be entirely renewed.

It occurs to the writer to suggest that if the still is constructed in segments, the corroded parts may be readily renewed at little expense and with little loss of time. Furthermore, should it be required to increase the capacity of the still, this may be done by adding segments.

A still of the kind suggested is shown in the accompanying illustration. It consists of segments formed by riveting sheet-iron to rings of angle iron, thus forming hollow drums which can be bolted together one on top of the other until a still of the required capacity is constructed. The bolts connecting the segments can be disconnected at any time for the replacing of a segment, while the joints between the rings can be made tight in the usual manner with asbestos or other packing.

The sides of the drums may be made of sheet-iron of $\frac{1}{8}$-inch thickness.

The bottom of the still should be made of thicker material, and may be of $\frac{1}{4}$- or $\frac{3}{8}$- inch iron sheet. In mounting the still over the fire-place, the ring with the bolts should be embedded in the mason work so as to protect it from the direct action of the fire. This will reduce the difficulty of removing the bolts when it becomes necessary to renew the bottom plate.



STILL. CONDENSER.

Scale, $\frac{1}{2}$-inch = 1 foot.

The top of the still should also be made of $\frac{1}{4}$-inch to $\frac{3}{8}$-inch iron sheet; it should be held in place by bolts and nuts (not shown in the drawing); these should be placed sufficiently close together to make a good joint, which may also be fitted with asbestos packing. A coating of blacklead on the cover will prevent this from sticking to the asbestos, and in this way the joint may be broken and renewed without difficulty.

If the top bolts are permanently fixed in the angle iron ring they will always be in place and cannot be lost: the nuts may be winged so as to enable them to be screwed down by hand without the use of a spanner.

Connexion with the condenser may be made through the side of the upper segment and near the top. This is preferable to making the connexion through the cover, for in this way the joint has not to be broken when the cover is removed.

In the drawing the still is shown connected to an 'Ideal' condenser. As this is made of copper, it is suggested that the connexion between the still and condenser should be made by means of a short length of flanged pipe made of vulcanite, so as to obviate galvanic action which would be induced by the contact of iron and copper, and would lead to the corrosion of the still.

The still is operated in the manner described in the *West Indian Bulletin* above referred to. A perforated grating is fixed in the bottom segment at a convenient distance from the bottom; a sufficient quantity of water is placed at the bottom of the still and the leaves or other material placed above the grating. For convenience in handling and removing, the leaves may be contained loosely in cages or baskets of iron wire; these baskets can be lifted out by means of the same hoist which is used to remove the cover, and this can be done without waiting for the still to cool.

The hoist referred to may consist of a simple wooden tripod standing over the still, and provided with a pulley and hoisting rope.

If the discharge orifice of the condenser can be placed at a height of some 3 feet or so above the level of the water in the still, it is possible to arrange that the distilled water separating from the oil in the Florentine flask, commonly used as the collecting vessel, may be conducted by a pipe directly back to the still, thus maintaining a constant water-level in the still and obviating the risk of burning from lack of water: at the same time it automatically leads to the recovery of any essential oil that may inadvertently escape in the waste water. To effect this, the condenser should be placed relatively much higher than is shown in the accompanying drawing: this may readily be done by lengthening the pipe connecting the still with the condenser.

F.W.

British Cotton Growing Association.—A report of a meeting of the Council held on July 4, refers to the possibility that the Association will definitely co-operate with the Indian Government with a view to the improvement of the cotton grown in India. As regards Africa, the report shows a very satisfactory state of affairs to exist. The purchase of cotton in Lagos to the end of June amounted to 8,748 bales, as compared with 4,318 bales for the corresponding period of last year. Similar increases are recorded for Northern Nigeria. It is mentioned that the quality of Nyasaland cotton has recently shown signs of deteriorating, and arrangements have been made for the Association to send supplies of the best quality of seed for planting purposes from Uganda.

THE BREEDING AND FEEDING OF PIGS FOR BACON FACTORY PURPOSES.

It has been mentioned before in this Journal that there exists at Salisbury, in Southern Rhodesia, a large bacon factory which purchases pigs from farmers situated in that country. A similar establishment has been suggested for the West Indies, but circumstances, up to the present, have not been sufficiently favourable to enable any definite steps to be taken. In time, however, they may, and attention should be called to a valuable article which appears in the *Rhodesia Agricultural Journal* for April 1916, containing instructions as to the best methods of breeding and feeding pigs intended for sale at such a factory. It will be understood that a different type of animal is required for bacon purposes than for the production of pork and lard. The article in question keeps this fact well in view, and begins first of all with a description of a side of bacon, indicating the relative value of the various cuts.

The bacon pig itself, when ready for the market, should possess a long, deep body, with a straight or slightly arching top, and straight underline. The shoulder should be fairly upright, joined closely to the body, and nicely rounded over the top. The body should not be any thicker through the shoulder at any point more than half way up from the underline to the top line than through points at a similar height situated between the shoulders and the ham. Described shortly, a straight-edge laid against the side from the shoulder point to near the tail should touch at every point. The ribs should spring out well from the spinal column and should make a deep-bodied rather than a round-bodied animal. The legs should be good and clean, straight-boned, while the neck should be of medium thickness with no tendency to coarseness. The average live weight of a pig intended for the bacon factory should be from 150 to 200 lb. Large and coarse pigs give only second class produce.

As regards the breeds of pigs suitable for bacon, the article calls special attention to the Berkshire, the large Yorkshire, the middle Yorkshire, the small Yorkshire, the Tamworth, and the Large Black. It is stated that the Large Black appears to be admirably adapted to the climate of Rhodesia, which is sub-tropical. Being late in maturing, this breed crosses well with the Berkshire and other early maturing breeds. Indeed, since the establishment of the British South Africa Company's factory in Salisbury, the most satisfactory cross has been found to be the progeny of Large Black sows and Berkshire boars. The cross results in increased stamina, and increased proportion of lean meat as compared with the pure Berkshire, and earlier maturity than in the pure Large Black.

After dealing with other crosses, the article goes on to consider the management of pigs, dealing with the subject as regards the boar, the sow and young pigs. It is stated that the boar should never be allowed to fall off in condition, but should never be overfed. The same applies to the management of the sow, but this animal should be provided with plenty of nutritious food after farrowing. A large amount of instruction is given in regard to the management of young pigs, and the reader interested is referred to the article under consideration for details.

Turning to the feeding of the animals, it is emphasized that, as in breeding so in feeding the object must be to produce quality. Then follow some general observations on the feeding of pigs which appear worth quoting: 'To one who wishes to become expert in the feeding of pigs or any kind of animal, nothing can take the place of daily practice and experience; at the same time a short study of the scientific side of the question of animal nutrition will be found to be extremely helpful. It will enable one to think and experiment more intelligently, and in most cases will materially add both to one's interest in the work and to the profits to be derived. Science with practice is of infinite value, but one must never forget that animals are not machines, that they have individual tastes, appetites and dispositions much like human beings. The expert and successful feeder is one who can endow every animal in his care with a personality, who can watch and understand its ways and habits, and who constantly provides not only for its bare supply of food, but for its varying whims and fancies. Those unaccustomed to animals will smile at this statement, but the writer feels confident that it will be endorsed by any and every successful feeder of animals.'

Attention is then given to the nutritive ratio of different foods, that is to say, the proportion of nitrogenous substance to carbohydrates and fats. Thus when we say the nutritive ratio of maize is 1:8, it is understood that maize contains 1 part of digestible flesh-forming substance to 8 parts of digestible heat-, fat-, and energy-forming material. The proximate composition of some twenty different vegetable foodstuffs is considered, including some of those commonly employed in the West Indies, such as maize, velvet beans, ground nuts, sweet potatoes, and grass. The nutritive ratio of velvet beans is 1:2·5, while that of sweet potatoes is 1:28·8. These figures clearly indicate the relative richness of velvet beans in flesh-forming material compared with sweet potatoes, which are very poor in nitrogen, but nevertheless valuable in their own way in a ration for pigs.

A number of sample rations are given, and one or two of these may be noted. For heavy brood sows in pig, when on moderate grazing, the following ration has been found to answer satisfactorily: sweet potatoes 6 lb., maize 1 lb., ground nuts 1 lb. When very little grazing of any kind is available: skim milk 10 lb., sweet potatoes 6 lb., maize 2 lb. When no milk is available, as will probably be the case in the West Indies, the following is suggested: maize 3 lb., beans 1 lb., and pumpkins or other cheap succulent food up to about 10 lb. daily. For young pigs from two and a half to four months old, running on fairly good pasture, the following may be given: potatoes 2 lb., ground nuts ¾ lb., maize ½ lb., pumpkins 5 lb. It may be pointed out here that English potatoes and sweet potatoes differ widely in composition. The nutritive value of the English potato is 1:14·4, whereas, as already stated, that of the sweet potato is 1:28·8, which shows that English potatoes contain relatively a greater amount of flesh-forming material. So that if sweet potatoes are used in place of English potatoes, it will be necessary to increase the amount of nitrogenous foodstuff in the ration. For pigs from four to six months old, the following ration is suggested: potatoes 6 lb., ground nuts 1 lb., maize 2 lb., plus grazing or ample supply of pumpkins, etc.

As regards crops for pig feeding, special reference is made to maize velvet beans, sweet potatoes, pumpkins (or majordas). These latter are described as being the most valuable food for pigs, and one of the cheapest means of providing succulent food. The seeds of pumpkins are very nutritious, and they tend to check the invasion of worms. These vegetables give the best results when fed raw.

The sweet potato is described as an easily grown and profitable crop, forming in Rhodesia a nourishing and succulent food at a time of the year when succulent food is scarce. Sweet potatoes are particularly convenient for planting in small areas for pigs to harvest themselves. As regards velvet beans, this plant is described as a heavy cropper, useful

either for the grain or for green food, or for making into ensilage. If grazed, the pigs should be turned in about the time the beans are ripening. If used as a soiling crop, it should be cut before the beans form. The beans themselves, ground into meal and mixed with maize, form a well-balanced ration, especially for 'topping up' pigs. They should be used sparingly with young pigs, as they are liable to be too heating. One of the best possible crops for pigs, and one which when fed in conjuction with maize produces a really good bacon, is peas. Their use tends to prevent the loss of stamina and reproductive power, which is induced by an exclusive diet of maize; but peas should not be fed alone, especially to young pigs, as they cause unthriftiness; they should always be used in conjunction with some starchy food such as maize or sweet potatoes.

In closing this summary of the valuable article under notice, reference may be made to its concluding section on the housing of pigs. It is stated that the elaborate housing of pigs in a warm country is not only unnecessary, but to some extent, quite apart from the question of cost, undesirable. Light, air, dryness, and shelter are the principal requirements. For styes the only suitable permanent floor appears to be cement. In a temporary sty, where the outside portion is not cemented, it is always as well to raise the bed of the covered part of the sty even as much as 2 feet above the level of the exercise yard outside. To enable the animals to get in and out easily, a sloping way should be made from one level to the other.

DEVELOPMENTS IN THE POTASH INDUSTRY OF THE UNITED STATES OF AMERICA, IN 1915.

H.M. Embassy at Washington has forwarded an extract from *Commerce Reports* (Washington) of April 24, summarizing a Review of the developments in the potash industry in the United States in 1915, which has been issued by the United States Geological Survey.

The Review states that potash salts were produced in the United States in 1915 to the value of $342,000 (about £70,300). The imports of refined potash salts in 1915 were 76,141 tons, or slightly more than 25 per cent. of those in 1913, the latest normal year of importation. Imports of potash fertilizers, kainit, manure salts, and double manure salts amounted to 20,427 tons, or only about 3 per cent. of the importation in 1913. Taking all the potash salts together, imports in 1915 were about one-tenth of the quantity normally imported.

In 1915 potash was recovered, as a by-product, from the manufacture of Portland cement at Riverside (California). By-product potash from this source has yielded a considerable revenue, owing to its abnormally high price, and in obtaining it two other purposes have been subserved: the saving of additional material to be converted into cement, and the elimination of the dust nuisance. Manufacturers of Portland cement having had their attention directed to a possible revenue from by-product potash will not be slow in thoroughly investigating their raw material. Already a company near Hagerstown (Maryland), is reported to be installing a plant for the recovery of potash salts.

Potassium sulphate from alunite was first placed on the market late in October 1915, by a company at Marysvale (Utah). So far, the production has not been large owing to the incidents connected with a pioneer enterprise of this character, but, though certain foreign deposits of alunite have been worked for potash alum, this is the first recorded yield of potash salts as such from alunite. The product is of high grade.

A plant was established by an Omaha company in the spring of 1915 at Hoffland, near Alliance, in the northwestern part of the State of Nebraska, and during about half of the year the company obtained potash salts from the brine of an alkaline lake in that region.

In addition to the output from these sources, potash was also obtained from kelp along the Pacific coast.

Experimental work on the production of potash salts from different sources was active during the year, and in places this experiment has been succeeded by the setting up of plants. Operations are in progress at Searles Lake and at Keeler, on the shores of Owens Lake, California. It is reported that one company is erecting a plant near Great Salt Lake, and that another plant will soon be started at the south end of the lake. The by-product bittern has also received some attention at solar-evaporation plants at San Francisco Bay.

Great activity has been manifested in experiments for the recovery of potash from the silicate rocks, such as feldspar and leucite, from the mica sericite and from greensand. In many laboratories researches have been in progress, some of which, according to reports, offer prospects of profitable commercial development, if feldspars and other rocks rich in potash in sufficient quantity and purity can be found and utilized. A small quantity of potash salts was probably produced from these silicate rocks and minerals during 1915, and found its way into mixed fertilizers without intermediate refinement.

ESTIMATION OF GUM AND PECTIN IN FILTER-PRESS CAKE.

The following is a translation of the conclusions arrived at in an article by Dr. T. Vander Linden in *Archief voor de Suikerindustrie in Nederlandsch-Indie* for April 1916, on the estimation of gum and pectin in filter-press cake:—

On the basis of the foregoing, we can now give the following generally applicable prescription for gum and pectin determination in filter mud.

Twenty grams of filter mud are digested for half an hour with 200 to 400 c.c.— according to the requirements of the nature of the material—of a mixture of 100 parts of 95 per cent. alcohol, with 20 parts of hydrochloric acid, specific gravity 1·09 (obtained by diluting acid of 1·18 specific gravity with a like volume of water).

After digesting, it is filtered and washed with warm alcohol until neutral. The precipitate is then placed in a beaker and repeatedly extracted with warm water until the extract amounts to 300 to 400c.c. This extract is evaporated on the water bath to 40c.c., and after cooling, the pectin is precipitated with a mixture of 300c.c. alcohol (95 per cent.) and 60c.c hydrochloric acid of 1·09 specific gravity. After several hours' settling the precipitate is filtered with an ash-free filter, dried at 105°C., and weighed. The precipitate with the filter is dried at 105°C. to constant weight and then reduced to ash. The weight of the precipitate diminished by that of the ash gives the weight of the pectin-like substance.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. J. Brooks's report for June states that cacao is flowering, the lime crop coming in steadily, and reaping operations in connexion with the sugar crop are complete. Plant distribution included—limes, 3,709; oranges (budded), 25; mangoes (grafted), 3; cassava cuttings, 600; vegetable seeds, 105 packets; decorative and economic, 97. Operations in the Botanic Gardens and Experiment Stations consisted chiefly in routine work. Extension in cultivations most marked in the Dennery district is said to be due in a great measure to the prospect of obtaining a good carting road. The Agricultural Superintendent visited Soufrière, La Perle, Palmiste, and Ruby estates, whilst the Agricultural Officer visited Marquis and Anse-le-Raye. Two meetings of agricultural interest were held during the month, both of which were attended by the Agricultural Superintendent: one for the purpose of drawing up a report relating to the question of land settlement for members serving in His Majesty's Forces; the other, held at Soufrière, for the formation of an Agricultural Credit Society. The arrival of the Imperial Commissioner of Agriculture in the island on June 29, for a stay of two weeks, is recorded.

NEVIS. According to Mr. W. I. Howell, the several plots in the Experiment Stations suffered much from want of rain. From the Botanic Station, plant distribution during June included 4 lb. beans, 2 lb. Indian corn, 66 tomato, egg-plant, etc., and 455 lb. cotton seed. The sugar-cane crop is almost reaped, and a fair amount of the sugar made has been sold already, at fairly good prices. The young canes throughout the island are suffering much from want of rain, and growth in many of the fields has been seriously checked. The cotton crop, on the whole, is said to be very backward. Several fields have been planted, but the plants have practically all been killed by the hot and dry weather, hence there is hardly a well-established field in the island. A fair acreage is prepared, but planting is retarded by prevailing weather conditions. Provision crops have suffered similarly, as a result of the dry weather. Regular visits have been paid to the estates and peasants' plots in different parts of the island, and advice given where required. A large number of coco-nuts have been collected at Pinneys estate, but no shipments could be made as the steamers do not take any freight.

Mr. Howell also forwards a report for the quarter ended June 30, 1916, which embodies the chief items of interest for the period under review, which have already been published in previous issues of the *Agricultural News*. The rainfall for the quarter was 6·64 inches, and for the year to date 17·35 inches.

VIRGIN ISLANDS. Work in the Tortola Experiment Stations during June appears to have consisted chiefly in the preparation of land for the cotton seed farm, about 5 acres being in course of preparation; and the weeding of plots and planting of selected Indian corn. Conditions have been favourable to growth, says Mr. Fishlock, and a good deal of cotton has been planted. The lime trees at the Station give promise of a fair yield. A visit was paid to Virgin Gorda (Sound and Valley), and also to Anegada. A meeting was held at the first mentioned island, at which the new arrangements concerning the purchase of cotton were discussed.

SEA ISLAND COTTON MARKET.

ISLANDS. As advised in our circular report of June 3, the crop has been practically all sold; consequently the market is closed until October, when the new crop will begin to come to market. The quotations are nominal, and are based on prices last paid, viz:—

Extra Fine 31c. to 32c. = 20½*d.* to 21*d.* c.i.f. & 5 per cent.
Fully Fine 30c. = 20*d.* " " " "

FLORIDAS AND GEORGIAS. The demand has continued throughout the month of June, on account of the Northern and Southern Mills, at very steady prices, taking the limited offerings in Savannah market as well as such lots as were obtainable in the interior towns. This demand has reduced very much the unsold stock, leaving generally only such cotton as is held off the market in anticipation of higher prices, under the impression that some mills require further supply before the next crop is marketed.

We quote, viz.:—

Fancy	30½c. = 31½c.,	landed.
Extra Choice	29½c. = 30½c.,	"
Choice	28½c. = 29½c.,	"
Extra Fine	27½c. = 28½*d.*	"

The exports from Savannah since June 3 were, to Northern Mills 506 bales, Southern Mills 314 bales, and from Jacksonville to Northern Mills 1,626 bales.

Crop Advices. The weather during the month of June has been generally favourable, and the crop has made satisfactory progress. The entire section has had beneficial rains, which have improved very much the outlook. Although in some instances the young plant is reported small and backward, the general condition is quite up to a good average, and with continuance of favourable weather, the new crop may begin to come to market the latter part of August and early September. Estimates still are about 100,000 bales and upwards.

This report also shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester, up to July 1, 1916, were 754 and 443 bales, respectively.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the quantity and estimated value of the Sea Island cotton exported from the West Indies for the quarter ended March 31, 1916:—

Colony.	Quantity, lb.	Estimated value £.
Barbados	58,013	3,868
St. Vincent	156,349	10,423
Antigua	30,500	2,351
Montserrat	254,150	19,591
St. Kitts	99,810	6,238
Nevis	76,705	4,794
Anguilla	9,250	578
Virgin Islands	9,002	525
	693,779	48,368

MACHINE PLOUGHING IN CUBA.

The Director of the Cuban Agricultural Experiment Station, writing in a recent issue of the *Louisiana Planter*, says that from experience covering a number of years in the tropics, he believes that most agricultural machinery used in the United States is too light for the tropics, and this applies to hoes, cultivators, ploughs, waggons, tractors—in fact, to the whole list of machinery used in the cultivation of sugar-cane, or for general use on the plantations. This is the reason why many manufacturers after going to considerable expense to introduce certain tools or machines have finally failed. Every sugar plantation that has gone extensively into cultivation has its scrap heap of machines that failed chiefly because they were too light and weak. Some of these tractors with their ploughs have failed because they were put to heavy work for which they were not made, and their machinery condemned because the tests were too rigid. This applies particularly in connexion with the heavy soils of Cuba.

Turning to the prospects before the more general adoption of motor power in field cultivation, he believes that with the continued development of the sugar business, there will come a consequent scarcity of pasture lands, or sugar-cane lands will become too expensive for pasturing cattle under the present system. Labour is also becoming more expensive, and it is foreseen that the labour will be one of the greatest limiting factors in sugar production. All of these indications point to the use of machinery in all possible farming operations, and especially in the preparation of land for sugar-cane planting. There is another reason perhaps more potent than any one thus far mentioned. The mills have been improved to such an extent that they are the equal, perhaps, of those found in any country, and the processes of manufacture leave very little to be desired. A great deal of money has been spent in perfecting the manufacturing side, and the best talent has been employed in this branch of the industry. But after all is said, the sugar is made in the field, and the next great improvement must be made on the cultural side. It is nothing for a manufacturer to spend $100,000 in so improving his factory that he may get 3 per cent. more yield, but he hesitates a long time before spending one-half of that sum in the field that might easily result in a 10 per cent. increased yield. Heretofore cultural operations have waited on the operations of the mills, and preparation for plantings could not be made during the harvest season, since all oxen and men were required to harvest cane and manufacture sugar. As a consequence, very little spring planting has been done, and it is usually done rather late to secure a good crop the first year. With power ploughs land can be prepared at any season of the year with but little hindrance to the other work that is being carried on.

QUARANTINE, AND THE INTRODUCTION OF NEW VARIETIES OF SUGAR-CANE INTO THE UNITED STATES.

Some apprehension is felt by those interested in the sugar-cane industry lest the Federal quarantine that now forbids all importations of sugar-cane will prevent further work along the line of introducing new and improved varieties of sugar-cane. The United States Department of Agriculture recognizes, however, that in the introduction of new varieties lies one of our strongest hopes for improvements in yield, disease resistance, or other desirable characteristics of the cane. There has been provided for years by this department in its office of foreign seed and plant introduction in the Bureau of Plant Industry, an avenue through which the introduction on a small scale can be made of promising new varieties of sugar-cane as well as other quarantined plant material and also non-quarantined plants and seeds; without exposing our home industries to the risks involved in the indiscriminate, uncontrolled introduction of varieties. Until more extensive facilities are made available for propagating such imported varieties under quarantine, limited space in the quarantine greenhouses of the department at Washington, D.C., is available for the propagation of small shipments of cuttings which officials of this department, or of any State sugar experiment station may desire to introduce. For the present, the amount of such shipments must necessarily be limited to a few stalks each. After such samples are propagated in quarantine long enough to make sure that they harbour no dangerous disease or pests, they may be released from quarantine and planted wherever the introducer may wish.

Private individuals, learning of new varieties that seem desirable ones to introduce, should communicate with the Bureau of Plant Industry of the department, or with the officials of a State sugar experiment station relative to the introduction of such variety, giving a full description of the variety in question, its origin, and where it may be secured for importation. Unless such variety is a new seedling variety, originated by some foreign experiment station, the chances are that it has already been introduced and tried, and that, if it has been found promising, it may now be available somewhere within the United States.

A few serious pests which are now annually doing an immense amount of damage to our sugar-cane crop have already been introduced. Other very dangerous pests and diseases not known to have been introduced as yet in the United States, are known to occur in foreign sugar-cane countries, making it important that measures be taken to guard against their introduction. Among the diseases which either are not yet introduced, or are not widely disseminated in this country may be mentioned the sereh, of Java, various root rots, the Queensland stripe disease, the Formosa down mildew, the iliau, and the pine-apple disease. Because cane is propagated by planting from the stalks and not from seed, it is especially difficult with this crop to make sure that the plant material does not harbour pests or diseases—hence the occasion for first growing it in quarantine.

The need of the precaution of growing newly imported samples first in quarantine is well illustrated in an incident that occurred two years ago. The Porto Rico Agricultural Experiment Station desired to introduce a variety of cane from Hawaii. Officials of this department offered to assist in securing the sample, and when it arrived at Washington, they took the precaution of propagating it the first season in the quarantine greenhouse. In spite of the fact that the cane was very carefully selected and prepared for shipment by an official of the Hawaiian Sugar Planters' Experiment Station, and of the fact that when it arrived it appeared free of pests or diseases, it developed during that season an abundant crop of the Hawaiian leaf-hopper, one of the most destructive insect pests that has ever been known to attack the sugar-cane. The Porto Rican planters, through this simple precaution and the subsequent destruction of this cane, doubtless were saved from losses on account of this pest, such as the Hawaiian planters once suffered. In Hawaii at one time these losses mounted into millions of dollars annually, and threatened the complete destruction of their great sugar industry.

Seed of sugar-cane for use in originating seedling varieties also may be imported, through the department, from localities which are known to be free of dangerous diseases or pests. (*Louisiana Planter.*)

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the natural resources of the British Empire, with special reference to those products which are of interest in connexion with the West Indies.

Ingenious suggestions with reference to the construction of a simple still for essential oils are contained in an article on page 259.

Useful facts concerning the banana will be found in an article on page 269.

Under Insect Notes will be found an account of important observations in connexion with the cotton stainer in St. Vincent: Plant Diseases consist of two articles on diseases in Porto Rico.

Papers at the Cotton Conference.

The Cotton Conference number of the *West Indian Bulletin* (Vol. XV, No. 4) contains, apart from a report of the discussions and unprepared statements made by the various delegates, several formal papers which deserve careful study by those interested in the production of cotton on scientific lines. The first of these is a paper entitled, Some Lint Characters of Sea Island Cotton, by S. C. Harland, B.Sc., while another of much technical interest deals with the Diameters of Cotton Fibres, with Some Notes on Their Breaking Points, by F. W. Lamie, M.A., B.Sc., and S. C. Harland, B.Sc. Dr. Tempany also read an interesting note on twists in relation to fineness, while not the least valuable paper was that prepared by Mr. W. N. Sands on the Anderson Oil Expeller and Equipment, installed at the Government Central Ginnery, St. Vincent. It might be mentioned here that, by a mistake, in the report on the Conference it was made to appear that Mr. Harland had prepared the paper referred to, whereas the case is that in the absence of Mr. Sands from the Conference, the paper was merely read by Mr. Harland. The same applies to a statement read, appearing on page 269 of the Bulletin. Readers interested in cotton should take note of Mr. Nowell's remarks on the habits of growth of the cotton plant, with particular reference to the cultivation of single stalk cotton.

A Fixed Standard of Purity for Milk in St. Kitts.

The Order-in-Council made in the Presidency of St. Kitts-Nevis on April 13, 1916, with reference to fixing the standard of purity for milk under the Sale of Food and Drugs Ordinance Amendment Ordinance, 1915, has recently been amended in accordance with the recommendations of the Commissioner of Agriculture. In the original Order of April 13, the regulations had regard to the aggregate total of solids in milk, which in the standard adopted was required to be not less than 11·5 per cent. The feature upon which analysts largely depend in ascertaining whether milk has been adulterated by watering is that, in normal milk, the solid matter other than fat is remarkably constant in amount and very rarely indeed falls below 8·5 per cent. The amount of fat may vary largely and may run up to 5 per cent. It is therefore necessary in stipulating standards to have regard to fat and solids-not-fat separately. This has now been done in the Amended Order referred to. Milk sold in St. Kitts must contain not less than 3 per cent. of fat, and must not contain not less than 8·5 per cent. of solids other than fat. The Order also provides that the milk must not be drawn from any diseased cow, nor must it be diluted with any other liquid, and provision is made to enforce the production of milk under as sanitary conditions as possible.

Onion Seed for the Leeward Islands.

During the first week in August, the S S. 'Europa' arrived at Barbados from Teneriffe and landed 950 lb. of onion seed, consigned to the Imperial Department of Agriculture, for distribution in the Leeward Islands. This large amount of seed, which is sufficient to plant approximately 250 acres, shows the great extension in onion growing that has taken place recently in Antigua and elsewhere. The growth of this industry has largely been the result of the activities of the Antigua Onion Growers' Association, the organization of which has been referred to on frequent occasions in this Journal.

Exports from Dominica, 1915.

A statement of the imports and exports of Dominica during 1915 discloses that the value of the lime products exported was £170,655, compared with £149,018 in 1914, and £142,431 in 1913. An analysis of the first total given shows it to be composed of the following items: raw lime juice, £55,276; concentrated lime juice, £53,469; lime juice cordial, £891; green limes, £48,026; pickled limes, £524; lime oils, £12,469. Other figures that may be noted are coco-nuts, the exports of which were worth £1,582; cacao £39,301; Bay leaves, £423; and Bay oil, £387.

The great proportion of these products was taken by the United Kingdom.

Returns from Different Cane Varieties in Demerara.

The *Daily Argosy* (Demerara) for Saturday July 22, contains an interesting report showing the results of the cultivation of the principal varieties of sugar-cane crops of 1915, on not less than five plantations, and on areas of over 20 acres of the variety. The greatest quantity of sugar per acre was given by Green Transparent, namely, 2·03 tons; this is followed by D.118, which gave, on an average, 1·98 tons sugar per acre; then by D.185, D. 419 and D.625. The Barbados varieties and the Bourbon come low down in the list. B. 208, for instance, gave on an average only 1·52 tons of sugar per acre. This variety is bracketed with D. 109. The report under notice also gives the areas under the principal varieties of cane in 1915 and 1916. The variety D. 625 is by far the most popular variety in Demerara, though B. 208 and Bourbon occupy very considerable areas. This appears rather curious, considering their yield of sugar per acre is below that of many other varieties. A decrease in 1916, however, is indicated in the case of B. 208. On the other hand, there was an increase in the area under Bourbon. As regards the area under other crops, a large decrease is indicated for maize and ground provisions, while considerable increases have occurred in regard to the areas under rice, coco-nuts, coffee and limes.

Feeding Coco-nut Cake on Grass.

The *Journal of the Board of Agriculture* (England) for May 1916, publishes details and conclusions arrived at on the use of coco-nut cake as a food suitable for beef production on aftermath or other grazing.

Since the outbreak of war, the shortage of linseed and cotton cakes has caused the stock-feeder in the United Kingdom to turn his attention to feeding stuffs which were somewhat unfamiliar to him. Of these coco-nut, ground-nut, and palm-nut kernel cakes are now well-known examples. Recent work has demonstrated the value of coco-nut cake for milk production, but no information was available as to the value of coco-nut cake as a food for beef production in combination with grass. Hence, as is indicated above, a field trial was conducted last year on the farm belonging to the Cambridge University School of Agriculture, with a view to getting evidence on this point. The beasts used for trial, fourteen in number, were Herefords, or of Hereford type, this type of animal being chosen in consequence of the belief that they would be more fastidious about cake than some of the other breeds. The trials consisted of feeding on grass without cake; cake feeding, including coco-nut cake, on grass; cake feeding, without coco-nut cake, on grass. Tables are given showing the results. Following are the conclusions arrived at:—

(1) These trials appear to show that coco-nut cake when suitable in price, is useful, if judiciously used, for feeding to bullocks on grass; but that it is not very palatable, and so should be gradually introduced into a mixture of more pleasing foods.

(2) The writers are inclined to advise restricting the amount to 50 per cent. of the concentrated ration. They further think it should be fed with something rather binding, such as cotton cake.

(3) It is believed that without some such food as linseed cake, which is known to be much liked by cattle, much waste would take place, as it seems that when coco-nut cake is fed the abundant crumb which is formed is only eaten when mixed with something very tempting, such as linseed cake dust.

(4) It is the writers' opinion that the ration to work up to is a daily ration of 4 lb. of a mixture 3 parts of coco-nut cake, 3 parts of cotton cake, and 2 parts of linseed cake.

A foot note is added in reference to (3), to the effect that subsequent to these trials, cattle have repeatedly been found to eat freely a mixture of coco-nut cake and ground-nut cake.

Vomiting Sickness.

An important paper appears in the *Annals of Tropical Medicine and Parasitnology* (issued by the Liverpool School of Tropical Medicine) on 'vomiting sickness' in Jamaica. Investigations have shown that the majority of cases in which a reliable history, concerning this fatal disease, was obtainable, akees (the fruit of *Blighia sapida*) formed part of the last meal taken in health, and that this article of food could not be excluded in a single case. Administration of an extract of akees produced typical symptoms of the disease in three kittens and one pup. In the paper nothing is said as to the probable nature of the poisonous principle, from the chemical stand-point.



INSECT NOTES.

ATTEMPTS AT THE CONTROL OF PLANT BUGS.

The many efforts that have been and are being made in the West Indies to evolve a satisfactory means of control of the cotton stainer, lend a special interest to an account given of work on the closely comparable problem afforded by the tarnished plant bug, *Lygus pratensis*, in North America.

The following particulars are abstracted from the section dealing with means of control to be found in Bulletin No. 346 of the Cornell University Agricultural Experiment Station, entitled 'The Tarnished Plant Bug', by C. R. Crossby and M. D. Leonard. Although the results of the different attempts at the control of this plant bug have been largely negative, they are nevertheless of value as a guide, while there is some possibility that although unsuccessful in regard to the tarnished plant bug, some of the attempts might prove helpful in regard to cotton stainer control.

It is admitted that the control of the tarnished plant bug is still an unsolved problem. Most of the remedies suggested are either inadequate to meet the demands of pratical growers, unsuited to the conditions under which the crop is grown, or impracticable in other ways As regards the experiments made with contact insecticides, it is stated first that very indifferent results were obtained with kerosene, even under laboratory conditions. In the field, the greater part of the injury is done to the plant by the adult bugs, which are particularly hard to hit and difficult to kill even when struck with the spray.

Pyrethrum is unsatisfactory for the same reason as kerosene emulsion, and furthermore, it is too expensive to be used on a large scale.

Soap solutions have not been used successfully. Similarly, tobacco decoctions have given negative results as a rule. Deterrents like unslaked lime, sulphur, and ashes have proved of little benefit.

Many writers, realizing the inefficiency of both contact insecticides and deterrents, have recommended catching the insects in various ways. Jarring has been tried and with success, but only on a small scale. By this method the insects are shaken into pans containing soap or kerosene. In a large field, a fresh supply of bugs will soon take the place of those captured.

The insect net and the use of sticky shields have proved unsuccessful.

The Bulletin under review then goes on to consider certain experiments made in New York. This work showed first of all, that the use of insecticides like soap, nicotine and kerosene emulsion for killing the tarnished plant bug is entirely out of the question. It is added that it would doubtless be feasible to kill the nymphs in this way, but they do practically none of the damage

Thinking that a substance with an obnoxious smell might have a deterrent effect, plants were sprayed with a 20-per cent. solution of tincture of asafœtida diluted 1 oz. in 50 oz. of water. On the next day there was no appreciable odour left on the plants, and there were apparently as many bugs present as before.

Dusting experiments were next tried, and many difficulties were met with. It was found ultimately, that the cheapest and simplest method was the best, namely, the use of tinned quart milk cans with the bottom perforated with a large number of nail holes to form a kind of pepper pot. Plants were dusted by means of this with flowers of sulphur and hydrated lime in equal parts; flowers of sulphur and land plaster in equal parts; and land plaster alone. The dusting was discontinued owing to the fact that after a short time practically all the terminals showed some injury on both the dusted and undusted rows.

In experiments with sticky shields, smeared with 'tree tanglefoot', it was found that the device was not sufficiently efficient to make its use worth while. In an attempt to increase the efficiency of the screen, small branches were tacked on the ends so as to stir up the bugs and cause them to take flight. The result was not successful, and the device was ultimately discarded.

Thinking that some sort of suction machine corresponding in principle to the well-known house vacuum cleaner might be used for catching plant bugs, a blower was used having a 30-inch fan attached to a 4 h. p. gasoline engine. With this machine, it was not found possible to get enough suction over an opening 8 inches in diameter to draw in bugs resting on the hand and held at the mouth of the pipe. Even if it were possible to construct a suction machine that would draw in adult bugs from the trees, such a machine would necessarily be so heavy that it would be very difficult to mount it so that it could be drawn through the nursery rows. The proximity of the rows to one another would also give rise to difficulties. In the face of these facts it was concluded that this method of catching the bugs is impracticable.

An experiment with molasses as a trap, showed that this substance offers no attractions to the tarnished plant bug.

The Bulletin under consideration concludes with suggestions for future experimental work in the control of the tarnished plant bug. As this insect flies low it was thought that wire fencing of a small mesh might be used to protect nurseries from infestation. It appears that the bugs will not fly over the fence but they will crawl up it, and once they reach the top, fly down on the other side. It is suggested that a band of sticky substance like tanglefoot might be run around the top of the fence, and such a device is thought to be worthy of trial, and the writers of the Bulletin under notice express their intention of proceeding further in this direction.

The last suggestion is that bagging might be useful in the case of peach seedlings, to protect the leaders from injury. It is pointed out that the damage to the tips of the laterals does not affect the commercial value of the tree. This method therefore is not impracticable, considering that only a limited amount of bagging would have to be done.

ADDITIONAL NOTES ON THE NATIVE FOOD PLANTS AND FEEDING HABITS OF THE COTTON STAINER IN ST. VINCENT.

In previous articles published in the *Agricultural News* (Nos. 369 and 370) an account was given by Mr. W. N. Sands, F.L.S., Agricultural Superintendent, St. Vincent, of the native food plants and feeding habits of the cotton stainer (*Dysdercus delauneyi*, Leth.) in St. Vincent, together with suggestions for the control of the pest. The notes embodied in this account were made chiefly in the period February to May. Since the end of the last named month to date (July 20), additional investigations have been undertaken by Mr. Sands, and the results of these are of much interest and importance.

It was shown in the articles referred to, that the silk-cotton (*Eriodendron anfractuosum*) and 'John Bull' (*Thespesia populnea*) trees were the chief food plants of the cotton stainer in St. Vincent in the close season for cultivated cotton, and were therefore a menace to the cotton industry. Infestations of young cotton fields have now been definitely traced to these sources. In the Leeward District, notably at the Experiment Station and Clare Valley-Questelles cotton stainers from fruiting silk-cotton trees were found in the cotton cultivations in June searching for food; fortunately, the season was a late one, and the cotton in most cases had not reached the flowering stage. However, at the Experiment Station, young bolls on May sown cotton were immediately attacked and infected with internal boll disease. At Clare Valley and other places the pest found out and fed on cotton seed and cotton seed meal, used as manure, which had not been carefully covered over with soil. In the Windward District, a fine field of cotton planted in April was badly attacked by cotton stainers from John Bull" trees, and a very high percentage of bolls was found to be diseased internally on July 15. The early planted cotton was, therefore, already badly damaged.

There were no stainers on silk-cotton trees generally in July, but they were found in the vicinity of the trees feeding on seed disseminated by the wind. On fruiting 'John Bull' trees at this time they were still present in very large numbers in all stages of development. In the article published in the issue of the *Agricultural News* of July 1, which was written in May, the following passage occurs:—

'When it is mentioned that cotton planting was started in April close to a large number of badly infected "John Bull" trees, it will be realized that unless the tree is destroyed, it will be impossible to prevent the cotton stainer from badly damaging the valuable Sea Island cotton crop.'

It will be seen that this apprehension was well founded, and the outlook for the cotton crop this season in some districts is thereby considerably clouded

In view of the situation, the local Government proposes to pass immediately an Ordinance which will enable the Agricultural Department to take such action as may be deemed necessary to control the pest.

A full account of the measures taken and the result will be given at a later date, but it may be mentioned here that attention will be devoted at the outset of the campaign to the destruction of 'John Bull' trees and the collection of the stainers found on them, in order that the pest may not be driven into the young cotton fields. It is proposed to use the fruits of the John Bull trees, and possibly also cotton seed and cotton seed meal, as traps in the vicinity of the destroyed trees.

WORK AT THE EXPERIMENT STATION, VIRGIN ISLANDS.

Mr. W. C. Fishlock, Curator of the Experiment Station, Tortola, Virgin Islands, has submitted a quarterly report on the work of the Station for the period ended June 30, 1916. In the first part of the period under review, there was considerable activity in connexion with the sugar, cotton, lime, and onion crops. The cane crop, so far as the Station is concerned, was brought to a close on April 18. As regards cotton, the last shipment of lint has not yet been made, but the factory was closed for the purchase of cotton on May 27. By July 7, 100 bales, aggregating 22,228 lb. lint had been shipped. There remained in store 6 bales and 2,550 lb. of ginned cotton.

The preparation of a lot of fresh land for the cotton seed farm involved considerable labour. The fresh area had to be cleared of bush and cultivated. The present block will give a continuous area of close on 8 acres, and as less than 5 acres of cotton are required, it will be possible to effect a rotation of crops.

As regards the condition and progress of the experiment plots, Mr. Fishlock gives details of the cultivation work performed but says little concerning their condition at time of writing. The coco-nut demonstration plots received attention in the way of cutlassing and weeding. Good growth is still being maintained on this plot. It is hoped to lessen the cost of upkeep by allowing certain selected persons to make use of the land, rent free, in return for which they will be expected to keep the plants weeded.

Concerning the onion industry, it is stated that the total weight of onions sold locally and shipped, amounted to 9,094 lb., in addition, 50 lb. were kept in the drying house as an experiment to ascertain how long onions might be kept without deteriorating. When all transactions are completed, and the accounts made up, a report on the season's work will be sent in.

Turning to the cotton industry, it is of interest to note that the Government has decided to put a profit-sharing scheme into operation with the coming crop, i.e., in November next. Notices have been issued concerning this scheme Fortunately, the planting season has, in the main, been favourable; but trade conditions in St. Thomas are bad owing to the dislocation of business caused by the war and the stopping of the Hamburg American Line of steamers, thus causing many British Virgin Island persons who had formerly found employment in St. Thomas, to return home. The conditions are also very unsettled in San Domingo. This combination of circumstances has had the effect of turning the people's attention to cultivation in their own islands, and, as cotton is one of the few crops they can plant with good hope of fair returns, they are planting more freely than has been the case for some years past. It is hoped that, once they can tide over the first year and secure a satisfactory bonus, the profit-sharing scheme will prove to be all for the good of the industry.



GLEANINGS.

The Curator of the Experiment Station, Tortola, has forwarded a return showing the quantity of concentrated lime juice exported from the Presidency of the Virgin Islands for the quarter ended June 30, 1916. This amounted to 6 casks containing 240 gallons, valued at £50.

We have been informed by the Agricultural Superintendent, St. Lucia, that a small patch of Columnrais coffee has been successfully raised by the Agricultural Department and that a few plants will be set out at Réunion Experiment Station for trial. This coffee was described in the *Agricultural News.*

By June 30, 1914, fifteen societies with unlimited liability, had been registered in Mauritius under the provisions of the Co-operative Credit Societies Ordinance (1913). The aggregate working capital of these societies amounted to Rs. 125,676, of which a sum of Rs. 37,550 or less than 30 per cent. was lent by the Government.

A paper in *Mededeelingen Van Het Proefstation voor de Java Suikerindustrie*, on the morphology of the sugar-cane, with illustrations, which is preliminary to a description of the varieties of sugar-cane, should prove valuable to the same end in the West Indies. Those engaged in the selection of the sugar-cane should give this paper their attention.

The Agricultural Department in the Southern Provinces of Nigeria furnishes the native cacao growers with a certificate when their cacao has been cured, according to the rules laid down by the Department. Where a certificate is held, the merchants have willingly given a higher price for the cacao. This practical method naturally appeals to the farmer, and has done much good.

Reference to the different species of Castilloa rubber tree will be found in the *Bulletin of the Jamaica Department of Agriculture* (Vol. I, No. 8). There appears to be three different species in Jamaica: *Castilloa Guatemaltaca*, the first introduced into Jamaica; *Castilloa elastica*, the true Castilloa: and *C. costaricana*, from Costa Rica, of which there is now a small plantation in Jamaica.

Conclusions as to the manuring of corn are to be found in the *Phillipine Agriculturist and Forester* for January to February 1916. In Philippine soils, the use of reasonable amounts of phosphatic manure appears to be profitable. Corn does not seem to show any sign of preferring one form of fertilizer to another as a means of supplying the same element of plant food. Applying large amounts of commercial nitrogenous fertilizers does not pay in the Philippines.

According to an article in the *Gardener's Chronicle* for May 20, 1916, leaf spot on vines is closely correlated with the amount of boron compounds in the soil solution. The question has been raised, as to whether the condition of the leaves of sugar-cane grown on 'gall' patches in Antigua may not be caused by the same compounds. Boric acid in solution above a certain concentration is toxic to plants; when present in lower proportions it produces spotting or browning of the leaves.

The price of all kinds of skins is so high at present that the Jamaica Agricultural Society is agitating that in time tanning might be increased to such an extent in Jamaica that it would be unnecessary to import leather. In connexion with this suggestion, the Journal of the Society reproduces some useful notes on the manufacture of leather. These show that the defects are—the importance of drying, trimming and curing. Curing is done by spreading ordinary coarse salt evenly all over the hide.

We have received a copy of the Jamaica *Daily Gleaner* for July 3, 1916, containing a map showing the level or easily accessible areas in that island which are suggested as being suitable for the cultivation of sugar. Altogether of first class land there is an estimated available area of 84,205 acres, and an available area of second class land amounting to 33,500 acres. This gives a total of 117,705 acres, which is a larger area than that estimated by the West India Committee in their recent investigation concerning the extension of the British Colonial sugar industry.

The general result of the Woburn pot culture experiments and field experiments with Professor Bottomley's 'Humogen' is as follows: Under conditions such as those obtaining in green-house cultivation, and where plants can be regularly watered and tended, a good preparation of humogen may produce a very marked increase in the growth of the green parts of plants and in the growing of green crops, but it will show practically no benefit in the production of grain. Under natural conditions of crops growing in the open, it has not as yet been established that as regards the ordinary corn crops of the farm, any advantage is likely to accrue from the use of humogen when used in quantity such as a farmer is likely to be able to afford. Details as to these experiments conducted at Woburn will be found in the *Journal of the Royal Agricultural Society of England*, Vol. 76 (1915).

USEFUL FACTS CONCERNING THE BANANA.

The Banana and Its Culture in Jamaica, is the title of a useful article by the Director of Agriculture of that Colony, appearing in the *Bulletin of the Department of Jamaica*, New Series, Vol. I, No. 4, issued during 1911. The writer gives consideration first to the botanical aspects of the banana plant, special attention being given to the root system and the fruit system, both of which are obviously of great importance in connexion with culture and yield. As most planters will know, the banana has an extensive root system, but one that has very weak penetrative power and is exceedingly susceptible to any adverse conditions in the soil. Free drainage to a depth of 4 to 5 feet for the accommodation of the anchor roots, and a mellow tilth for the free development of the roots in the surface soil, are two conditions that are essential. Where rainfall is deficient, irrigation must he provided, as the succulent roots of the banana plant very easily perish from want of moisture. In regard to the fruiting system, it is pointed out that there are three sets of flowers, and that the number of 'hands' in the bunch is determined as soon as the three types of flowers on the stalk have been formed; it is therefore evident that the grade of fruit is settled at a comparatively early period in the life of a sucker. The size of the individual 'fingers' may be modified by subsequent circumstances, bnt the number of 'hands' that a bunch shall contain is incapable of increase in the later stages of growth.

The section in the article under review dealing with varieties of the banana is of very considerable interest. It shows how the millions of bananas now cultivated in Jamaica have practically all been derived from a single plant of Gros Michel, introduced into Jamaica about 1836 by John Francois Pouyat, a French botanist and chemist who settled in the Colony about 1820. It is stated that while other varieties are grown to a limited extent, the Gros Michel, for size, flavour, uniformity of bunch, and good shipping qualities, is superior to any other in Jamaica. Some thirty varieties of bananas have been under trial at the Hope Gardens for the past seven or eight years, and although many of these have a high reputation in India, Java and other parts of the East, they nevertheless possess, as already intimated, some defect from the commercial stand-point. The Chineese banana or Cavendish banana common in Barbados, is regarded as quite inferior for all commercial purposes in Jamaica as compared with the Gros Michel. It has to be remembered, however, that there are many who prefer the distinctive flavour of the Cavendish banana to that of the larger, but somewhat coarser Gros Michel.

In dealing with banana soils, the writer draws attention to the remarkable developments that have followed the initiation of schemes of irrigation. In one part in the dry plains of St. Catherine, 10,000 acres of land that was formerly only of nominal value for grazing purposes, have been made to produce good crops of bananas simply by the artificial application of water. In the parish of Trelawny are found some of the richest soils in the island, but owing to the droughts that periodically occur, the bananas have been found to be apt to dry out; but the planters have successfully overcome this difficulty by means of mulching, that is by the application of grass mulch on a liberal scale, thereby improving the moisture content of the soil. It is of interest to note this good effect of mulching in the case of the banana, since its value has already been demonstrated in regard to cacao and limes.

The reader who wishes to begin planting bananas will find full instructions given in the article under consideration. Some of the information consists of that furnished by planters themselves and can be regarded as essentially practical and, therefore, useful. Concerning the distance of planting, it appears that any departure from the usual system of 14 feet spacing, which is now generally adopted in Jamaica, does not prove advantageous in the long run. In regard to preparing holes for suckers, it is stated that fairly deep holes measuring, say, 2 feet 6 inches each, will give better results than the usual shallow hole 1 foot deep. The suckers to be planted are selected six to eight months old, when they are about 10 feet high. The information then given concerns cultivation after planting, the treatment of suckers, including pruning. Concerning harvesting methods, it is believed that instead of employing the cutter by himself, it is a better plan to have a cutter and a helper working together, the latter catching the bunch and handing it to women who are employed to carry it to a particular spot.

Much interest centres round the probable return from banana cultivation, especially if the figures are such as refer to actual plantation practice. In the article under consideration, accounts submitted by two Jamaica planters are published, and these provide us with a good insight into the expenses and returns that may be expected. On one estate, the total annual expenditure was £2,038 14*s*. 4*d*., and the total receipts £3,635 10*s*. 8*d*. This refers to an estate of 200 acres, in an irrigated district. On another estate situated in a non-irrigated district on the north side, the total expenditure was £1,250, and the total receipts £2,668. On this estate 30 acres were planted to produce a crop the following year. There were besides 135 acres yielding fruit, of which 50 acres were plants, and 85 ratoons. These figures indicate that very considerable profits may be looked for from banana culture, especially after the plantation has become established, and provided that there is an organized system of transport and marketing, such as exists in Jamiaca.

The area under bananas in Jamiaca in 1909-10 was 69,066 acres, and the value of the fruit exported in 1909-10 was something approaching $1\frac{1}{2}$ million pounds sterling. This shows the enormous dimensions of the Jamaica banana industry. In 1915 the value of the bananas exported was £1,490,563, the area under this crop being 86,854 acres.

The weather in the neighbourhood of the Virgin Islands during July was in a disturbed condition around the 9th instant. According to the Curator of the Experiment Station, the clouds on the 8th indicated anti-cyclonic conditions, but by the morning of the 9th these conditions changed, and the wind blew from about north-east, with squalls of rain, the barometer being somewhat low. During the day, the wind veered from east to south-east, and in the afternoon blew quite strongly from nearly south. Heavy rain fell on the afternoon of the 10th, and thunder occurred on the morning of the 11th. The movements of the wind and the cloud indicated the passage of a cyclonic disturbance to the south-west of Tortola. The state of weather referred to was connected with the cyclone that was the cause of several days' delay of steamers southward bound at that time from New York to the West Indian islands.

PLANT DISEASES.

A NEW CANE DISEASE IN PORTO RICO.

The following account of a disease of sugar-cane not previously recognized in the New World will be read with some concern by sugar planters. It is taken from the report of the Pathologist in the Fourth Report of the Board of Commissioners of Agriculture of Porto Rico, 1914-15.

Cytospora sacchari. This is a comparatively new disease of cane, for which no common name has as yet been proposed. It was first discovered in 1912 by the former pathologist, on foreign varieties of cane at Rio Piedras, and there seems no reasonable doubt but that it was introduced with some one of these varieties, large numbers of which were brought in from all parts of the world until the establishment of the plant quarantine. The only other known report of its occurrence outside of Porto Rico is from British India, where it was described as a very unimportant disease of the stalk and leaf sheaths.

To date it has been found in Porto Rico on the following cane varieties: at Rio Piedras on Barbados Nos. 7169, 6385, 1753, 8660, 7245, 3696, 3859; Demerara No. 109.

Near Carolina a well developed case was found in Rayada cane, though still confined to a small area, and in the eastern end of the island, B.1355, B.3922, D.117, GC.759, and GC. 47 were attacked.

The symptoms of the disease are well marked. Young shoots are killed outright, others checked in their growth, and at least the lower leaves killed. The leaf sheaths are bound firmly together about the stalk by the mycelium of the fungus, the leaf blades drooping in a characteristic manner. The exposed portions of the leaf sheaths are a dull dark-red in colour, and are covered in profusion with the fruiting bodies of the fungus, the long sharp-pointed necks of which project beyond the surface sufficiently to be readily seen, and give a rough sensation when the hand is rubbed over the area. During wet weather a minute yellowish globule of conidia can be seen with a hand lens exuding from the mouth of each pycnidium or fruiting body.

In addition to killing outright young shoots, the older stalks are invaded with a resulting dry rot which renders them worthless for sugar production.

Because of the fact that this fungus, of no importance in other parts of the world, has been able to attack a number of varieties of cane here, and do some damage, fears have been entertained that it would become epidemic. The situation is being closely watched, and an attempt will be made to eradicate it completely in those localities where it has appeared.

THE ABSENCE OF CITRUS CANKER FROM PORTO RICO.

A matter of interest to citrus growers, from the same source as the above, is the report of the quarantine measures taken against citrus canker, and on the results of a search for the disease, in Porto Rico.

As soon as the serious nature of this disease and the possibility of its entry into Porto Rico was realized, a press notice was issued as a warning to the growers. A quarantine measure was provided by the Board of Agriculture in December, prohibiting the entry of all citrus material from the Gulf States. The regulation was broadened in April to include all living plant material from the citrus-producting States, and citrus material from all parts of the United States. Great care has been taken to enforce this ruling, various packages of plants having been turned back or destroyed. Since the disease existed in Florida and other of the Gulf States for some time before it was discovered and announcement of it made, there was the possibility that during that time it might have reached the island on shipments of citrus or other nursery stock sent from infected nurseries. Since the disease is bacterial in its nature and very resistant to known methods of treatment, ordinary quarantine precautions such as fumigation as practised against insects, defoliation, etc., would not have availed to prevent its entry. Consequently the necessity arose of inspecting all shipments of plants to Porto Rico from the infected States, for as far back as the disease was known to have been present. The carrying out of this task was made possible by securing a list of all such shipments from the quarantine records. Then, as rapidly as possible, a careful search for canker was made on all plants included in these shipments in the various groves and gardens where they had been planted. This work has, to date, yielded no traces of canker, though certain of the plants have been examined several times. It is felt that at the present time Porto Rico is free of canker. Whether or not this freedom can be maintained, depends largely upon the attitude of the growers themselves.

PLANTS THAT STUPEFY FISH.

In Dominica, some years ago, fruits of a tree known locally as the Bois Bambarra, were obtained from the Pointe Mulâtre estate and forwarded to Kew for identification. These, in due course, were reported to be the fruits of a species of Diospyros. Owing to the absence of complete herbarium material, it was not possible to give the specific name. This matter remained in abeyance for several years, until a specimen of Bois Bambarra flowered in the Botanic Gardens. On receipt of this material at Kew, the tree was identified as *Diospyros Ebenaster*, Retz.

To the present, considerable doubt has existed in the minds of botanists as to the habitat of this plant. From careful enquiries made, there can be no question that *Diospyros Ebenaster*, Retz., is indigenous to Dominica. It occurrs in the forest as a large tree, and is fairly common near the coast on the Windward side of the island. It prefers localities in which the rainfall is ample, consequently it does not occur on the dry Leeward Coast.

In Dominica the fruits of Bois Bambarra are used for stupefying fish. The fruits are collected in quantity, then reduced to a pulp, which is placed in sacks or baskets for submergence in the deep pools in the rivers. In the case of fast flowing rivers, attempts are made to divert the rush of water as much as possible away from the pools about to be poisoned.

In the list of Dominica timber trees the Bois Bambarra is described as 'a large tree 4 to 5 feet in diameter of trunk; wood tough and strong, employed for oars, mortars, pestles, etc., timber also available for inside house work.'

An interesting article on *Dyospyros Ebenaster*, Retz. appeared in the *Kew Bulletin*, No. 2. 1915.

Another plant used for poisoning fish is known locally as the 'Nivrai'*. Herbarium specimens were obtained and forwarded to the Director of Kew, who kindly furnished the following memorandum: 'The plant received for determination is *Clibadium Vargesii*, DC. It is described by Grisebach in the *Flora of the British West Indies* as *C. Badieri*, but the former name is the corrrect one to use.

'Greshoff, in *Med. s' Lands Plant*, IX, p. 91, mentions its use for the purpose of poisoning fish. He calls it *C. surinamense*, Linn., following Baker's nomenclature in the *Flora Brasiliensis;* but *C. surinamense* proves, on a critical examination, to be quite different, and it does not seem to have the same properties as *C. Vargesii*, D.C. (*C. Badieri* Griseb.).

'Besides Dominica, the same species occurs in Trinidad, British and French Guiana, Brazil, Venezuela, Bolivia and Columbia, and on the labels of many of the specimens from these countries there is frequent mention of the use of the leaves in poisoning fish.'

A third plant used as fish poison is known locally as 'Erb-a-Picque.' It was identified by the Kew authorities as *Neurolaena lobata*, R. Br. It is recorded from Cuba, Jamaica, Martinique, St. Vincent, Grenada, Tobago, Trinidad, Mexico to Ecuador, and the Guianas.

In bygone days this plant was also used locally as a remedy for yaws. At the present it is employed in conjunction with the bark of the Mammee apple (*Mammea americana*) for making a wash for application to animals infested with ticks.

For the purpose of stupefying fish the soft stems and leaves of the two last named plants are collected in considerable quantities and pounded before immersion in the pools. Both the 'Nivrai' and the 'Erb-a-Picque' are mild in their effects, in comparison with the powerful action of the fruits of the Bois Bambarra.

The killing of fish in rivers either by poisoning, or by the use of explosives is forbidden by law. In spite of the prohibition both means are employed to a considerable extent in the country districts. The use of plants and their fruits for this purpose, which involves a considerable amount of labour, will probably cease in future and in their place the much too easily obtained dynamite cartridge is likely to become the sole means of effecting this unlawful purpose. (Report on the Agricultural Department, Dominica, 1914-15.)

*Probably corruption of French word 'Nourri', meaning to deaden: to stupefy.

THE MANUFACTURE AND STORAGE OF PEN MANURE.

At a meeting of the Antigua Agricultural and Commercial Society held on July 7, the subject entered on the agenda for discussion was that of the manufacture and storage of pen manure.

By way of opening the discussion, a short address was delivered by Dr. Tempany on certain points connected with this important problem. In his remarks the speaker reminded his hearers that about ten years ago the same question was discussed at a meeting of the Society by Dr. Watts, in relation to the results obtained with certain manurial experiments with cane.

He pointed out that during the intervening period abundant confirmation had been forthcoming from numerous quarters as to the paramount importance of maintaining the humus supply of soil under tropical conditions, and instanced the statement made by Mr. A. D. Hall to the meeting of the agricultural section of the British Association in 1914.

In view of the importance of organic manures, he therefore made no apology for returning to the subject, since in such an important matter it was essential that planters should endeavour to produce the largest possible amounts of organic material for manurial purposes, in the most economical and different.

Those anxious to obtain information as to the relative manurial value of pen manures and other organic substances capable of being utilized for manurial purposes, would find in the report on the Experiments on Sugar-cane conducted in the Leeward Islands during the year 1914-15, and recently published, a tabular summary containing analyses of over fifty representative samples of substances of this description; this had been reproduced with considerable additions and extensions from an earlier report.

Examination of some of the typical analyses of pen manure would show the very marked variation in composition exhibited by different samples, and he put it to the meeting, that in view of the importance of the question, more attention might be paid with advantage to this matter, and that the investigation of the losses taking place in the making of pen manure under the ordinary system practised on estates would abundantly repay the expenditure of money and effort.

He pointed out that under the system of manufacturing pen manure in vogue at the time, inadequate provision often existed for checking losses from the pens by leaching; moreover, in the absence of any means of checking these losses it was in possible to measure their extent.

He then went on to show how it would be possible definitely to measure the losses which are occurring in this way, by building specially constructed pens from which the excreta of the animals kept therein, together with the bedding and the litter were removed daily and stored in a specially constructed covered receptable; the floor of the pen would be sloped and provided with gutters and a sumpit for the preservation of liquid manure; this could be pumped from time to time over the heap. If a given number of cattle were kept in this way, and an equal number stored in an adjoining pen taking care that the number of cattle experimented with were sufficient to eliminate errors due to individual idiosyncracy, and also to maintain exact equality in the matter of feeding conditions, at the end of a known period of time it should be possible to ascertain the amount of manure produced in each pen, and by careful sampling and analysis to determine the relative value of each lot.

Apart from these considerations, it appeared to him that the health of the cattle would probably improve if they were not required to live over their excrement, as is frequently the case under present conditions.

He alluded to certain experiments on these lines which were taking place in St. Croix, and asked that planters would give the matter serious consideration with a view to taking similar action in Antigua.

In the discussion which followed, a number of planters took part, and while divergent opinions were expressed as to the magnitude of the losses which were taking place, it was generally agreed that it would be very advantageous if a series of expefiments could be carried out to ascertain their exact characctes.

MARKET REPORTS.

London.—The West India Committee Circular, June 29, 1916.

Arrowroot—3*d*.
Balata—Sheet, 2*s*. 5*d*.; block 2*s*. 2*d*. to 2*s*. 7*d*.
Beeswax—No quotations.
Cacao—Trinidad, 88/-; Grenada, 82/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—£31 10*s*.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 13*d*. to 20*d*.
Fruit—No quotations.
Fustic—£6 to £7.
Ginger—Jamaica, 95/- to 120/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—£8 to £8 10*s*.
Mace—7*d*. to 3*s*.
Nutmegs—9*d*. to 1*s*. 2*d*.
Pimento—£8 to £8 10*s*.
Rubber—Para, fine hard, 2/7¼; fine soft, 2/5; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 29, 1916.

Cacao—Venezuelan, $16·00 to $16·50; Trinidad, $15·25 to $15·60.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$5·75 to $6·00 per 100 lb.
Dhal—No quotations.
Onions—$1·50 per 100 lb.
Peas, Split—$11·00 per bag.
Potatoes—English $6·00 per 100 lb.
Rice—Yellow, $7·25 to $7·75; White, $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., J… 26, 1916; T. S. Garraway & Co., July 25, 19…

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·85 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manu… quotations; Sulphate of ammonia, $105·00 to $110… per ton.
Molasses—No quotations.
Onions—$3·55 to $5·00.
Peas, Split—$11·50 per 210 lb.; Canada, $6·00 per 120…
Potatoes—Nova Scotia, no quotations.
Rice—Ballam, no quotations; Patna, no quotatio… Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, Ju… 30, 1916; Messrs. Sandbach, Parker & … June 30, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sa… bach, Parke… & Co.
Arrowroot—St. Vincent	——	5c. per lb.
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	16c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$6·75 to $7·00	$7·50 to $7·…
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	7c.	$9·00 to $10·0…
Madeira	——	——
Peas—Split	$12·00 to $12·50	$12·00 to 13·0… per bag. (210 lb…
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	——	$4·80 to $5·0…
Lisbon	——	——
Potatoes--Sweet, B'bados	$2·40	——
Rice—Ballam	$6·75 to $7·00	——
Creole	——	$6·75 to $7·…
Tannias—	$2·40	——
Yams—White	$2·64	——
Buck	$2·64	——
Sugar—Dark crystals	$4·50 to $5·00	$4·50 to $4·00
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 56c. pe… cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Cotton Seed Meal as a Manure.

COTTON seed meal, the residue left after the extraction of the oil from cotton seed, finds employment as a manure in two ways: indirectly, as the result of its use as a feeding stuff for cattle; and, to a less extent, as a manurial substance applied to the soil direct.

In the West Indies, during the last year or two, much greater interest has been shown in this substance as a manure, and its utilization in this direction is of such great importance in the soil economy of certain islands, that a consideration of the subject in its several aspects should be of value.

As regards the British West Indies, cotton seed meal is manufactured in large quantities in Barbados, St. Vincent, and St. Kitts, and to a lesser extent in most of the other islands where cotton is grown. Most of the Barbados seed is imported, chiefly from the neighbouring West Indian islands and from Central America: the oil is extracted and either shipped or sold locally, while the meal and cake are disposed of almost entirely locally. Formerly, Barbados used to take large quantities of seed from St. Vincent and St. Kitts, but now that these islands possess their own extraction plants, they mainly export only the oil, and the residue remains for local consumption. The wisdom of this practice is obvious, when one remembers that it means that a large proportion of the plant food constituents taken by the cotton crop from the soil, eventually finds its way back again. In fact, the economic importance of the principle involved is so great that in the islands referred to, the Governments have given financial assistance in support of it. Thus, in St. Vincent, an Anderson oil expeller and equipment have been established by the Government at the central ginnery, at a cost of over £5,000; growers are paid, at present $8 per ton for their seed, and 1,700 lb. of meal is returned to them free for each ton of seed purchased. In this way the meal either indirectly or directly finds its way back to the land.

In considering the utilization of cotton seed meal for manurial purposes, it is important to realize that this by-product is capable of being manipulated. When the meal is screened—a process which removes the husk –its value as a food and as a manure is obviously increased. Conversely, the addition of this husk to undecorticated meal will produce a mixture of much lower value. If this is done, due allowance should be made in fixing the price, and growers would do well to ask for an analysis of any meal they may purchase or receive. In Barbados, at the time of writing, cotton seed meal is scarce, and the price of meal for feeding purposes is about £8 per ton, while inferior grades for manurial purposes are quoted at £7. Comparative analyses of the two products are not available.

According to English figures, the estimated value of the manure obtained by the consumption by cattle of 1 ton of cotton seed cake (or meal) undecorticated, is about £3 5*s*., while that for decorticated is in the neighbourhood of £5 10*s*. These figures are of interest in that first they show the high manurial value which the meal gives to the animal excreta; and secondly, in that this varies very much according to whether the husk is removed or not. Even greater will be the difference when husk has been added.

Although these figures seem to reflect very favourably upon the use of cotton seed meal as a feeding stuff and indirect fertilizer, it must be remembered that this manurial benefit is seldom realized in practice. Large losses accompany the manufacture and storage of pen manure, particularly the liquid constituents. Unfortunately it is the liquid manure that is richest in available nitrogen, potash and phosphates; so that to realize a manurial return of £3 to £5 per ton of cotton seed meal fed to cattle, much more scientific methods must be introduced in connexion with the storage of pen manure; it is especially important to make provision for the collection and storage of the drainings that one so frequently sees running to waste. A difficulty presents itself in the tropics, however, in that the cattle are used for working, and are for a considerable period of the day on the roads. Loss to the estate from this cause does not occur in temperate countries.

As a manure for the soil direct, we have a certain amount of definite information as to the value of cotton seed meal. When the price is reasonably low, and when there is an adequate supply, planters in Barbados use the meal as a manure for sugar-cane at the rate of about ½-ton per acre, with apparently satisfactory results. In Dominica, experiments have been in progress for some years involving the use of the meal as a manure for cacao. The mean result of eight years' trials has been that the cotton seed meal plot has given 1,766 lb. of cured cacao per acre against 1,264 lb. in the case of the untreated plot. The cost of the application, which was at the rate of 10 cwt. per acre, has been £2 10*s*. It is believed that a heavier dressing of cotton seed meal would produce even better results, as the quantity of nitrogen supplied to the plot in the 600 lb. of meal added, is considerably less than is applied in 4 tons of vegetable mulch to a plot of the same size, which gave a mean difference on the control of + 792 lb. of cured cacao per acre compared with + 502 lb. per acre for the cotton seed meal plot.

In Nevis some evidence has been obtained which indicates that cotton seed meal is a useful manure for coco-nuts. It is worthy of record, that in the experiments now in progress, this manure has come next to a dressing of complete artificials in regard to the benefit produced. But the experiments have not been in progress long enough to accept this as an established fact. In St. Kitts, cotton seed meal has been tried on cotton. No remunerative return has been obtained after many years' trials. This in no way reflects depreciatingly upon the general value of the meal as a manure, for in these experiments, even the use of artificial and pen manures has resulted in no appreciable gain, owing to the open and fertile nature of the soil.

Apart from practical experience, it is safe to argue by analogy, that cotton seed meal must have a very considerable manurial value both in respect of its direct and indirect application to the soil. Being an organic manure it will have, when applied direct, a beneficial action upon the physical conditions of the soil; it will tend to increase the humus content and consequently ameliorate the moisture conditions. So that one is not justified in basing one's judgment of its value upon a mere chemical analysis. Nevertheless a ton of cotton seed meal contains about 100 lb. of nitrogen, 24 lb. of potash, and 27 lb. of phosphoric acid. It is far richer in nitrogen than any other organic manure, and is only excelled by bat guano and sheep manure in respect of potash and phosphoric acid. Sulphate of ammonia contains 20 per cent. of nitrogen: that is, 1 ton will contain 224 lb. of nitrogen. The price of sulphate of ammonia in Barbados at the present time is about £22 per ton. The cost of 1 lb. of nitrogen in sulphate of ammonia is therefore approx-

imately 2*s.*; in the case of cotton seed meal it is 1*s.* 5*d.* (when the meal is at £7 per ton). Both of these prices are abnormally high, but taking into consideration what has been said concerning the organic nature of the meal, and its potash and phosphoric acid content, it would seem that for general purposes it would be cheaper to use cotton seed meal than sulphate of ammonia, or at least a mixture of the two. A definite decision on this point, however, depends largely upon the circumstances of each case, and may best be left to the individual planter to decide for himself. We may be content here simply to state the facts of the matter, trusting that their enumeration may be found useful and suggestive.

CANE BREEDING AND SELECTION IN PORTO RICO.

The benefit conferred upon the sugar-cane grower through the selection work that has been conducted for many years in Barbados and British Guiana is not confined to the agriculturists of those colonies alone. This can be readily realized from the large amount of attention that is being given to Barbados seedlings and methods of seedling production in Porto Rico. Here, two lines of experimentation are in progress: (1) comparative tests of Barbados and Demerara canes with the Porto Rico standards, namely, Yellow Caledonia and Otahaite, and (2) cane-breeding work which has included cross-pollination experiments.

In the Fourth Report of the Boards of Commissioners of Agriculture of Porto Rico, for the period July 1, 1914 to June 30, 1915, it is stated that several varieties have given noticeably better returns than the rest. Sealy Seedling has made a better showing than any of the others, considering the quality of the juice and the weight of cane produced. B. 1753, D.117, D. 109, and B. 4596 have also given excellent returns. B. 208 gave better results as a second ratoon than as a first. This cane was found to be very susceptible to the effects of dry weather, a characteristic which this cane is known to possess in the British islands. It is stated that the past year with its better rainfall was much more favourable for the growth of this cane than the previous one. A further experiment with introduced varieties more recently obtained was started during the year, and amongst those canes which so far appear promising are B. 1809, B. 7245, B. 6292, B. 3859, B. 3405, and B. 3747. All these varieties yielded higher in this experiment than either Crystalina or Otahaite, which were used as controls.

Turning to cane-breeding work, it is stated that an effort was made during the past year to obtain seedlings from cross-pollinated seeds. Mention is made of attempts in Barbados to adopt the method of emaculation and hand pollination. Such a method has been tried without success in Porto Rico. Attempts in Porto Rico during the past year have followed the method tried, among others, by Mr. J. D. Kobes in Java. The varieties to be crossed are planted in parallel rows with the pollen-sterile variety on the leeward side of one which is pollen-sterile, and which blooms at the same time. A large number of seedlings were produced from the tassels of the pollen-sterile varieties, and there can little doubt that they were from cross-pollinated seeds. T pollen-sterile variety in this case was the Otahaite, and pollen-fertile parent, B.347. Ordinarily the Otahaite ca produces tassels with a very small proportion of fertile se All attempts previously made with it in Porto Rico ha given a very poor germination, and very few seedling can This year, with B.347 growing on the windward side, a both flowering abundantly at the same time, the germinat was excellent. This is a good indication that the flowers w cross-pollinated, and very probably almost entirely by adjacent variety, B.347. Because of the way that stigma lobes project from the glumes, cross-pollination see to be very easily possible.

Another method was also tried with some success. consisted in tying together the tassels of the varieties to crossed, before the florets of either opened. Crystalina a D.109 were the varieties used, Crystalina being the poll sterile parent. A smaller number of seedlings were produ by this means, but the results were equally satisfacto There is perhaps more liability of getting crossed seed this method.

CHICLE GUM.

Attention having been drawn to the statement that Sapodilla tree (*Achras Sapota*, L.) in the West Indies d not freely yield the gum known as 'Chicle', while tr supposed to be of the same species growing in Cent America yield freely, complete herbarium specimens of Dominica tree were, in 1914, forwarded to Kew, togeth with a sample of gum for investigation and report.

The tree from which the gum was obtained is abo twenty years old. The trunk, which is 39 inches in gi at 3 feet from the ground, was thoroughly tapped from base up to a height of 8 feet. The yield of latex w $3\frac{1}{2}$ fluid oz., which gave $1\frac{3}{4}$ oz. of dried material.

There being no demand for Chicle gum in Engla the Kew authorities were unable to obtain a commerc opinion on the sample forwarded. Consequently another t was tapped and the sample of gum submitted to a firm produce brokers in New York, who reported as follows:—

'Your sample of gum, which we received under separ cover, has been submitted to one of the largest chewing g manufacturers in this country, and after tests in th laboratory they write as follows: "We can in all probabil use some of this, provided quantity could be furnish therefore, beg to enquire how much can be supplied prompt and also if arrangements could be made to have it co along regularly, and what quantities."'

In the meantime herbarium specimens of the Chicle g tree grown in British Honduras were received at Kew. the present it has been thought that two, possibly thr species of Achras are involved, and that the Dominica pl appears to be distinct from the British Honduras varie Further information on this matter is awaited with intere

Owing to the low yield of gum, the Achras comm throughout the West Indies is not likely to become importance in this respect, although the report from N York shows the gum to be marketable, if obtainable quantity. Its chief value lies in the excellent fruit wh the best varieties furnish, and which might still be furt improved by careful selection experiments. (Report on Agricultural Department, Dominica, 1914-15.)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore reports the plant distribution for the month of July included : limes 4,245, coco-nuts 800, cacao 280, and 25 ornamental plants. In addition, 400 immortel seeds, and 265 lb. of horse beans were sent out. Reaping operations in connexion with the sugar-cane crop were completed, the yield being above the average. A visit was paid by the Superintendent to Carriacou with the object of reporting to the Government on the suitability of an estate for land settlement purposes. The weather was favourable, the rainy season practically commencing about the middle of July. In the Botanic Garden and Experiment Station the work partook of a routine character.

DOMINICA. Mr. Joseph Jones writes to say in regard to staple crops, that good crops of limes are general and were coming in towards the end of the month. The sudden drop from 6*s.* to 3*s.* per barrel paid locally for yellow limes has caused considerable dissatistaction. Later in the month the price was put up to 4*s.* per barrel Forty-six copies of the *West Indian Bulletin*, Vol. XV, No. 4, were distributed to leading officials and planters in the island. Thirteen candidates presented themselves for examination to enable vacancies to be filled in pupils undergoing training in agricultural practice; two were selected for a two-years' course of training. Plant distribution included 5,950 limes, 50 cacao, 44 budded citrus, 2 grafted mangoes, and 3 miscellaneous. Mr. Jones futher reports an outbreak of red root disease observed on a lime estate, the primary cause of which he attributes to the too close proximity of the water-table Suggestions were offered to cope with the outbreak. Owing to pressure of work in other directions there was no opportunity for carrying on chemical work in the laboratory.

MONTSERRAT. According to Mr. Robson, work in the Experiment Station consisted of cultural and planting operations. For planting purposes the following were distributed: limes 2,850, Bay plants 770, ground nuts 40 lb. In the Botanic Gardens four distillations of Bay leaves were made, and both the bay and lime experiment plots received attention Cage experiments have been carried out in connexion with egg-laying habits of Exophthalmus weevils. Success has this year attended the raising of Bay seedlings in beds under shade. As regards staple crops, the outlook for the cotton crop, says Mr. Robson, is fairly good, rains being desirable early for the late planted area on the Leeward coast. Picking commenced on the fields planted in March, early in the month. There is very little evidence so far of damage by winds, absence of high winds being probably just as desirable as an ample rainfall. Cotton stainers and worms have appeared on certain areas, and measures of control have been carried out. The rainfall has not been sufficient for the development of the lime crop, and consequently, the fruits for August and September pickings will be small. There has been considerable development of black blight recently, following on attacks of the Lantana bug. The sugar exports are expected to reach somewhere in the neighbourhood of 400 tons, and there has been little difficulty so far in getting the crop shipped. A small quantity of Montserrat cotton was recently sold at 1*s.* 8*d.* per lb., but the average for the crop so far sold is about 1*s.* 5½*d.* per lb. An interesting case has occurred on one estate, where lime trees have recently died in the absence of scale insect attacks: a report on specimens of the roots was sent to the Head Office, where the diagnosis is confirmed that the damage was primarily caused by the grub of the Exophthalmus weevil. At a meeting of the Committee of the Onion Growers' Association it was decided to pay an interim bonus of 1c. per lb., which makes 1*d.* per lb. paid for onions. The payments have been made to small growers. There will probably be a further small bonus. The self-fertilizing of cotton flowers by the wiring method Mr. Robson finds to be easily manageable. The common cross-fertilizing bee (Dielis) he says has not, however, been seen this year. A visit by Dr. Tempany extending from July 9 to 14, was recorded. The rainfall has been well distributed, heavy rains occurring on the 11th, 12th and 13th. Since then there have been frequent light showers. The precipitation at Grove Station was 5·97 inches.

ANTIGUA. Plant distribution during the month of July, writes Mr. T. Jackson, included coco nuts 250, Eucalyptus 171, papaws 100, mahogany 30, Bay trees 35, and miscellaneous 79. Heavy rains did some damage to walks in the Botanic Gardens, and a considerable amount of labour was engaged during the month in repairing, etc. Several large trees growing in unsuitable situations have been cut down. The young cane crop in most districts of the island looks healthy and is making good growth, which has not been seriously retarded since planting took place. The quantity of sugar manufactured to date by Gunthorpes factory amounted to 10,200 tons; that made by Bendals to 2,130 tons approximately No great increase in area under cotton can be looked for this season. About 1,300 lb. of pedigree cotton seed has been selected and distributed for planting purposes. Several persons have been elected members of the Antigua Cotton Growers' Association, which now has a membership of forty-six. The rainfall for July was 7·2 inches; for the year 29·28 inches.

ST. KITTS. According to the Agricultural Superintendent's report, work in the Experiment Stations in July consisted mostly of planting operations, and in the Botanic Gardens general routine work was carried on. The central factory completed operations on July 22 with a total of 11,591 tons sugar from 101,240 tons cane. The muscovado estates are still grinding with good returns. Good shipments of sugar have been made by recent steamers, and the pressure has been relieved. The early part of the month was dry, but the fine rains in the middle of the month made a great improvement in the young cane crop, and the prospects for next season, says Mr. Shepherd, are so far excellent. The record return of cane per acre for this season was made by Douglas estate which gave 30 tons per acre over 300 acres, plants and ratoons. The young cotton crop is in good condition, and with good weather a fair yield may be expected. The acreage has been increased to a small degree beyond last season's planting, but the actual figures are not yet to hand. Visits were made to Brimstone Hill and Monkey Hill with reference to planting a small area in trees, as an experiment. High southerly winds and heavy rains with low barometer were recorded on July 13, and a slight shock of earthquake occurred on July 21. The rainfall for the month was 8·27 inches; total for the year, 29·41 inches.

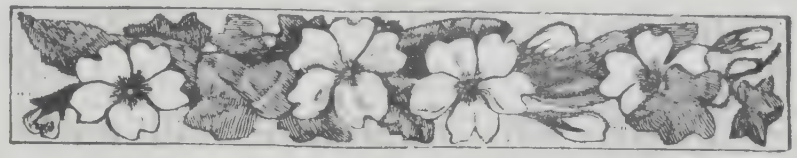
NEVIS. In his report for the month of July, Mr. W. I. Howell, in reference to the staple crops, says the young canes are looking very much better since the rains, and the outlook is more hopeful. The old crop is off on some of the estates. Cotton planting was in full progress during the month, but there has been a shortage of seed throughout the island, due to the great difficulty many of the growers have

in getting their fields established; many of the fields having to be planted three or four times, and consequently nearly all are irregular. A fair acreage was planted in provision crops during the month, chiefly sweet potato, cassava, and Indian corn. In regard to pests, it is mentioned that cotton worms attacked a few fields but they were kept in check by the prompt use of Paris green. The young cotton at one estate was attacked by Lachnopus, which did a fair amount of damage. The coco-nuts at Pinneys estate and Jones were visited during the month: a fairly large shipment of nuts from Pinneys was made. The following plants were distributed from the Station during the month: Bread and cheese seedlings 3,000, cotton seed 620 lb., sweet potato cuttings 9,900, cassava cuttings 1,150, and 4 lb. Indian corn. The rainfall for the month was 14·54 inches: for the year to date 31·19 inches.

VIRGIN ISLANDS. Mr. Fishlock writes to say that there is a considerable revival of interest in both the cane and cotton industries. As regards the former, a number of small new cultivations have been started, and as concerns the latter, appearances at present point to a good crop. Rain fell in measurable quantity on twenty-three days in the month, the total precipitation being 9·41 inches; the average for the month for the previous fifteen years was 3·93 inches. The weather from the 8th to the 16th was disturbed, the movements of the clouds, wind and barometer indicating the passage of two distinct cyclonic disturbances to the south-west of Tortola. Work in the Experiment Station at Tortola was of the usual routine character.

Demerara Government Lime Juice Factory. —The *Daily Argosy* mail edition for August 5, 1916, mentions the establishment of a Government factory for dealing with lime juice, as an accomplished fact. The plant is in operation at Onderneeming, and work was started during the first week in July last. A correspondent, writing to the *Argosy*, states that the Essequebo district has been placarded with posters informing farmers and others that fresh limes will be bought in large or small quantities, and the people are said to be now diligently gathering all the fruit they can get, and conveying it to Onderneeming. The plant, which has been erected at an estimated cost of $3,100, consists of a small three-roller mill, with rollers 3 feet by 12 inches driven by a 3 h.p. oil engine; there are the necessary strainers, and tubs so graded that the quantity of liquid which they contain can be estimated at any time; from these the liquid is pumped into a collecting vat at the top of the building, of the capacity of 500 gallons. The process of distillation described is similar to that obtaining at the St. Lucia Government lime juice factory. The *Argosy's* correspondent adds that when he visited the factory, there were on hand ready for shipment 3 hhds. of concentrated lime juice and 1 jar of distilled oil.

Panama Hat Palm (*Carludovica palmata*) has been largely propagated during the year, about 1,000 plants having been raised principally from seed. The success which has attended the formation of a Panama Hat School in Surinam, may possibly lead to the formation of a similar institution in this colony. The plant grows very readily, more especially on light land. On the semi-pegassy land in the North West District it grows rapidly. Trials on heavy clay land such as occurs on the coast-lands of the colony have not been attended with the success obtained on lighter land. The plants when growing under favourable conditions take about eight months to attain a size suitable for the making of hats.



PINE-APPLES FROM THE AZORES.

The Journal of the Royal Society of Arts, in the issue for June 23, states that St. Michael pine-apples—the raising of which has for years been the principal industry of the Azores—promise to follow in the wake of the Azorean orange. The orange was destroyed by a parasite; the pine-apple industry promises to be destroyed by over-production, combined with the reduced purchasing capacity of Hamburg and London markets since the war. In fact, the war has forced ruinous prices upon the local growers, many of whom are turning to different lines—some to tomato cultivation and some to the orange—while others are emigrating to the United States. A once flourishing industry, yielding nearly £200,000 a year to the people of St. Michael, has thus come to a standstill. The 1913 exports were valued at £109,000, and in 1914 they had declined to £64,000. According to a report by the United States Consul at St. Michael, the pine-apple industry of the Azores dates back to 1860, when it was discovered that the soil and climate of St. Michael lent themselves to the production of a superior fruit. Because of their size and luxuriant foliage St. Michael pine-apples sold at prices reaching £1 each in the early days of the industry. Now thousands are engaged in pine-apple culture. The result, as stated, has been over-production. When the production reached 50,000 cases annually, or 600,000 pine-apples, fancy pine-apple stock still brought 6*s.* to 8*s.* each in the London market. To-day, when the production is more than 2,300,000, the producers are obtaining only 6*d.* to 1*s.* 9*d.* each for their fruit. When the war destroyed the European market, the local growers endeavoured to dispose of their fruit in New York, Lisbon, and Gibraltar, but nowhere with marked success. The Azorean pine-apple being a high-priced fruit, it was soon discovered in New York that it could not compete with the cheaper Hawaiian product. At the time when the report was written, only Lisbon was buying in considerable quantities, and was proving to be an unprofitable market. Growers in St. Michael, it is said, were actually selling their crops at 25 to 50 per cent. below the cost of production. In former years Hamburg took about 65 per cent. of the St. Michael pine-apple (*Gardener's Chronicle.*)

We have received a copy of a small pamphlet entitled, Notes on West Indian Hurricanes, by F. H. Watkins. This gives an account of the causes and origins of hurricanes, the description of the course of the 1899 cyclone being of special interest. This storm formed about August 5 in the neighbourhood of the Cape Verde Islands and finally ended its existence at the mouth of the Loire, after taking thirty-six days to complete a trajectory around the Atlantic Ocean via the West Indies and the United States of more than 1,100* miles. The most useful part of the pamphlet is perhaps that dealing with warnings of approaching hurricanes, and the rules for determining the position and direction of an approaching storm. The notes would have been strengthened by the inclusion of a diagram illustrating the structure and passage of hurricanes in the West Indies.

*This figure, given in the Pamphlet, must be erroneous: it is probably intended to be 11,000 miles.—Ed. *A.N.*

COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates July 10 and 25, 1916, respectively, with reference to the sales of West Indian Sea Island cotton:—

West Indian Sea Island cotton has been in moderate request since our last report; the sales amount to about 100 bales, chiefly St. Vincent 19*d.* to 23*d.*, St. Kitts 20*d.* to 21*d.*, St. Eustatius at 16½*d.*, and stains 10¾*d.* to 12*d.* Prices remain firm.

West Indian Sea Island cotton has continued firm in price since our last report (July 10), particularly as there is some rumour of damage to the Carolina crop by storms. The sales amount to about 150 bales, including St. Eustatius 18*d.* to 19*d.* St. Kitts 20*d.*; Antigua 15½*d.* and Trinidad 18*d.*; with a few stains at 10½*d.*

The stock remaining in Liverpool is very small.

COMPARATIVE SPINNING TESTS OF FINE STAPLE COTTONS.

A Bulletin that is of interest to growers of, and merchants, manufacturers and dealers in, Arizona-Egyptian, Sea Island and Sakellarides Egyptian cottons and cotton yarns, is No. 359, of the Office of Markets and Rural Organization of the United States Department of Agriculture. This publication deals with comparative spinning tests of the different grades of the cottons mentioned, and is of interest in connexion with related matters discussed at the recent West Indian Cotton Conference. Although there is not much in this Bulletin that affects directly West Indian grades of Sea Island cotton, it forcibly shows the scientific character of the American effort to introduce new kinds of cotton. In the West Indies, we need to have tests carried out equally scientifically.

The tests showed that with respect to grades, 4 bales of Arizona-Egyptian were proportionately less wasty than 2 bales of Sea Island cotton from Georgia, and 2 bales of Sea Island were proportionately less wasty than 3 bales of Sakellarides from Egypt. There was no relation in the price of the different kinds of cotton to the percentages of waste discarded in the manufacturing processes. The reverse condition developed, namely, Arizona-Egyptian cotton was estimated to be lower in commercial value than Sea Island, and Sea Island to be lower than Sakellarides, when comparing equivalent grades. There was no significant relationship between the tensile strength of the respective grades of Arizona-Egyptian cotton. The difference in the tensile strength of yarn made from the three kinds of cotton was practically negligible. Considerable deviation occurred varying slightly in favour of first one kind then another, but, as a whole, resulting somewhat in favour of the Sakellarides Egyptian cotton, with the Sea Island coming second. However, the tensile strength for the highest number of yarns was in favour of the Sea Island cotton.

The tests which gave the foregoing results were conducted at the New Bedford Textile School, New Bedford, Massachusetts. It is hoped that in the near future facilities such as are afforded by this textile school may be available for the investigation of British-grown cotton, in the United Kingdom.

THE EFFECT OF CLIMATE ON THE PROPERTIES OF SOILS.

With a view to investigating the effect of climate o the properties of soils, interesting experiments have bee conducted simultaneously at the Maryland, the Kansas, an the California Agricultural Experiment Stations. Plots o soil 5 feet by 5 feet were transferred from one station t another so that at each station there existed the local soi plot, and the two introduced plots. As well as this ther was a local check plot of soil undisturbed.

It has been found that soils change markedly in colou in a period of seven years, and perhaps less, when move to other climates. For example, Kansas and Maryland soil at California become more deeply reddish in colour: Cali fornia and Kansas soils become bleached to a light grey o yellowish grey at Maryland. The differences are so great tha samples of any one original soil from the three differen stations to-day show no outward resemblance among them selves, but appear to represent three very distinct soil types

In general, the hygroscopic co-efficient, the moistur equivalent, and the wilting point of any of the soil increase when the soil is placed at California. Some excep tions to this rule are noted.

In general, bacterial numbers increase in arid soil placed under humid conditions. In general, also, the opposite is true for humid soils. The Maryland soil offers an excep tion to the latter rule.

Ammonification, nitrification, and nitrogen fixation follow the general trend of the bacterial counts as described in the last section. The general trend, however, applies in the case of nitrification to certain forms of nitrogen only. In the case of other forms of nitrogen very peculiar conditions exist, which are fully explained above.

Cellulose destruction by soils proceeds with greater rapidity under arid than under humid conditions with any given soil type. Cellulose destruction, therefore, appears to follow in general the opposite course of other micro-organic activity in soils affected by climate.

Marked changes in the arid soluble constituents of soils are wrought by climatic effects. It is difficult to generalize with respect to them, but it may be said that soils may often obtain accretions of the different constituents when removed from one climatic environment to another. Thus, for example, the California soil increases in lime at Kansas, and Maryland, particularly at the latter station, and loses in iron. The general tendency is for soils to increase in iron and decrease in alumina, when placed under arid conditions, and *vice versa*.

Phenomenal losses in certain constituents in five years seem to have occurred in some soils even when the latter were not moved. Thus, for example, the Maryland soil loses in the period named enormous quantities of magnesia.

Very interesting data are submitted on the total water soluble constituents in the soils studied. Large increases occur in the California soil in that respect when it is moved to the Kansas or Maryland stations. On the other hand, the Maryland soil gains in water soluble matter when moved to Kansas or to California.

The brief summary given above is merely fragmentary; the reader must seek a true picture of the variety and extent of the data obtained in the original paper in *Soil Science* for January 1916 (Vol. I, No. 1).

DISEASES OF LIVE STOCK.

VETERINARY REPORT FROM BRITISH GUIANA.

Some interesting information appears in the report of the Veterinary Division of the Department of Science and Agriculture for 1914-15:—

In the first place reference is made to certain matters in connexion with the feeding of live stock. During the year under review some experiments were made to find out whether it is possible to make hay successfully in Demerara. The ultimate results were satisfactory, Bahama and other grasses producing hay the smell and feel of which are stated to have been the same as those of the best English hay. Horses appeared to relish it. Unfortunately in the midst of the trial, a drought set in which compelled the experiment to be discontinued. As soon as an opportunity offers further supplies will be made and the feeding value of the hay determined.

The report next warns stock owners against the danger attendant on the feeding of stock on rice dust. This feed must be used with the greatest caution as the siliceous sheaths of the rice are swallowed and in many cases puncture the wall of the bowel, with the production of colic and the resultant death of the stock.

Turning to specific diseases, the report refers to an epidemic of swine fever that broke out. Difficulties were experienced in regard to the fixing of quarantine, and the control of the disease was further enormously handicapped owing to the fact that no serum has yet been produced which is capable of protecting pigs against the disease. Recent reports from England and the Continent however, it is stated, hold out every hope of the production of an effective serum in the near future. In the case of the epidemic referred to in Demerara, dozens of pigs died daily, and then the disease disappeared as suddenly as it arose.

On the East Coast during the year, anthrax, dreaded by all stock owners, made its appearance and spread rapidly. The control of the epidemic was handicapped by the fact that owing to war conditions delay occurred in getting a supply of vaccine, syringes and needles, more especially the latter. As soon as the necessary articles were received instruction was given by the Government Veterinary Surgeon to four or five assistants whereby they were shown how to perform the necessary operation. At first there was a strong opposition among the coolies to have their animals vaccinated, but with the help of the Immigration Agent the objection was gradually overcome. Up to the end of the period under review 13,000 head of cattle had been vaccinated and further supplies of vaccine were awaited to inoculate still more. The death rate was principally among cattle. Amongst mules it was very low. The reason for this was that a large number of mules had been vaccinated before the outbreak. Out of a total number of animals vaccinated only three, as far as is known, died from anthrax. It is emphasized that the only way to stamp out anthrax is by compulsory vaccination and the burning of all carcases.

THE FLOWERING OF THE DOUBLE COCO-NUT IN DEMERARA.

The following interesting observations are taken from the Annual Report of the Department of Science and Agriculture of British Guiana, 1914-15:—

The female plant of the Coco-de-Mer or Double Coco-nut, *Lodoicea Seychellarum*, flowered for the first time during the year in the month of September, bearing three flowers. The male plant flowered in December. The flowers of the female were fertilized in March 1915. One of them produced a fruit. Another female plant produced its first spike on March 2, 1914. This did not, however, mature. This plant resembles more in habit the male than the other female plant, the leaves being erect and adhering closely to each other. It is interesting here to record the history of the introduction and growth of the double coco-nut at the Botanic Gardens. In his Annual Report of 1892-3, Mr. G. S. Jenman, then Government Botanist, states that twelve nuts of the Coco-de-Mer or double coco-nut were received from the Seychelles, packed in sawdust in teak cases. Of these eight had germinated on the way and were dead. The other four had not germinated, but their vitality must have been lost as they failed to germinate although planted under the most favourable conditions. Later, towards the beginning of 1893, a second consignment of twelve nuts was received packed in damp material; these arrived in good condition. Of them, ten germinated, and eight succeeded in passing the stage at which the first leaf expanded above the ground. Mr. Jenman gave the period required for germination as two to six months, the same period being usually required for the spike-like sheath originating in the embryo to appear above the ground. Five more plants were added to the collection from a consignment received later in the year. The site selected for their permanent occupation was the calabash avenue running north and south in the nursery. Three plants died in the following year 1894, while one plant is reported to have taken over two years before the point of the spike-like sheath appeared above the surface of the ground. Five more plants died in 1895. In the report of the Acting Superintendent of the Gardens for 1901-2, it is stated that only four plants of this palm remained. One of these was subsequently lost, and the remaining three, two female and one male, are still in the collection. One of them produced a pistillate spike in March 1907, when fourteen years old. This flowering was quite abnormal in point of time, it having been reported that the flowers are not produced under thirty years. The same plant produced another spadix in July of the same year. The male plant flowered for the first time in 1908, and the remaining female plant in March 1914. The last named has up to the time of writing produced three spikes, none of which have been fertile. The first mentioned female plant has borne altogether eleven fruits.

According to the *West India Committee Circular* for July 27, coffee crops in the Blue Mountains in Jamaica are very short this year, owing to the excess of rainfall last year, when there was over 200 inches of rain in the Blue Mountains. Freights on coffee to Liverpool are 160*s*. compared with 45*s*. before the war.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the interesting subject of cotton seed meal as a manure.

A note on cane breeding and selection in Porto Rico will be found on page 275.

Items of Local Interest appear on page 276.

A discussion on the subject of peasant instruction on page 281 will be read with interest.

The recently issued report on the Agricultural Department, St. Lucia, for 1915-16, is reviewed on page 285.

Exports from the Gold Coast.

It is stated in *The Board of Trade Journal* tha the value of exports of the products of the Colony i 1915 amounted to £5,814,810, as compared wit £4,469,753 in 1914, and £5,023,646 in 1913. Th increase over 1914 was, therefore, 30 per cent., and ove 1913, the last record year, 15 per cent.

The quantity of cacao exported amounted t 77,278 tons, as compared with 52,888 tons in 191 The increase in quantity was due to the fact that ne areas came into bearing during the year.

Exports of palm kernels declined from 5,633 tons i 1914 to 4,064, tons in 1915 owing to the cessation shipments to Germany, which was the principal mark for this product.

The decline in the exports of palm oil was du to the neglect of the whole palm product industry f the more profitable cacao industry, and considering th steady decline of the former industry since 1910, it to be feared that it is doomed to extinction, except i certain districts that are unsuitable for cacao-growin Exports of palm oil in 1915 amounted to 330,99 gallons, the lowest on record, not being quite one-sixt of the volume of exports in 1910.

The Material Basis of Co-operative Credit.

The credit of any individual person rests partl upon the amount and value of his property, and partl upon his character and reputation for success o failure in his agricultural or business undertaking These two fundamentals are referred to in the *Agricul tural Journal of India* as the *material* basis and th *personal* basis, respectively, of credit. That journal goe on to point out that it is the essence of the co-operativ credit movement that by incorporation with join unlimited liability, the personal credit of a grou of persons becomes very greatly strengthened. Thi outstanding fact does not, however, diminish the nee or advantage of developing credit with a material basis Not only farm implements, buildings and better culti vation, but also immaterial property rights are impor tant bases of security, and every society should do its utmost to strengthen its position in regard to increasing its material value.

The above remarks hold good under West Indian conditions, but it should be remembered that under the West Indian Co-operative Credit Acts the Governments protect themselves and also at the same time the security of the society, by forbidding the investment of loans in any way but for an agricultural and productive purpose. It is perhaps in connexion with the most profitable and economical manner of disposing of the loans for productive purposes that should be considered by the borrower, and receive the attention of co-operative credit society inspectors, in the course of their duties.

Agricultural Instruction for Peasants.

The importance of the work of affording small holders practical instruction in regard to the cultivation of their crops, particularly permanent crops, is referred to in our review in this number of the recently issued Report on the Agricultural Department of St. Lucia. It should be remembered at the same time that this instruction can be usefully given with a view to improving the skill of the labourer who works on the estate as well as that of the man who has his own land.

Ever since the land settlement schemes have been in operation in the West Indies, with which agricultural instruction is closely associated, there has been an idea current that this tends to have an adverse effect upon the labour supply. In this connexion some remarks by Messrs. G. Auchinleck, G. Whitfield Smith, and W. Bertrand, who have been in close touch with the work referred to in Grenada are of interest:—

'The increase of labour supply consequent on the establishment of the settlements must therefore be attributed to some cause other than the removal of labour at the expense of the more thickly peopled districts.

'The fact is, that the improvement of the quality of labour may be explained by the realization of a very human trait: a peasant barely subsisting on low labour wages will always be shiftless, unreliable and disinclined to work, but the instant he becomes a land owner and is able to provide himself with good food and comfortable living, he seeks labour in order to obtain money for further luxuries. At the same time his absolute dependence on the larger owners is, of course, greatly lessened, but it has not been found in the past that such absolute dependence leads to any ultimate benefit, either to the larger owners or to the community as a whole. The general effect of a peasant settlement on labour supply may then be summed up by saying that labour is improved in quality and quantity *because* the peasantry are more independent—a fact which is by no means peculiar to the West Indies.' (See *West Indian Bulletin*, Vol. XIV, p. 12.)

According to a recent quarterly report by the present Superintendent of Agriculture in Grenada (Mr. J. C. Moore), agricultural instruction in that island is being continued on increasingly active lines. Two Instructors are at work, and during the quarter ended June 30, 1916, they spent fifty-nine days in the country districts and visited 191 holdings and six schools. These visits took in all the parishes of the island. The neighbouring island Dependency of Carriacou was visited twice.

Prize-holding schemes, which constitute an integral part of agricultural instruction are also being actively carried on under the aegis of the Agricultural and Commercial Society of Grenada, and it would be a good thing if the same amount of interest in this line of educational effort were shown in several islands other than Grenada.

The duties of the agricultural instructor have little personal connexion with the planter himself, but the planter is in a position to derive much benefit from visits paid by the Superintendent of Agriculture, and cases where official routine work will not permit of time being devoted to making these visits are to be regretted.

In closing these remarks it may be said that visits to the country districts by departmental officers constitute a most valuable part of departmental work, and as far as possible provision should always be made for its accomplishment.

Shallow-water Resources in Turks Islands.

The Direct West India Cable Company in their communication to the *West India Committee Circular* (July 27) appear despondent concerning trade conditions in theTurks Islands at the present time, particularly as regards salt. It is satisfactory, however, that the shallow-water fisheries are going ahead and relieving the situation.

'Business, as far as the salt industry is concerned, is dormant. From news to hand from New York, it is not likely any vessels will be chartered to load salt for some time owing to the high rate of freight charged, and it is evident that unless the situation speedily changes, a serious crisis must ensue. The Committee recently appointed to inspect and report on the ponds, etc., in the Dependency have completed their inspection, and have been in session several days; but what the outcome will be is hard to say. Their report should in any case be a very interesting one.

The new conch shell industry is growing rapidly, and there are now several buying and shipping the shells to New York, as many as thirty sailing craft arriving from the Caicos Islands with shells in a day.

'The sea front presents a lively appearance while unloading during the early hours of the morning Unfortunately, the odour from the partly decayed portion of the conch left in the shell is very offensive, and does not encourage one to spend much time in the vicinity. The dried conchs are being shipped to Hayti by thousands, and at first were selling at 4*s*. a hundred, but owing to the quantity shipped the price has dropped considerably. The shipment of dried conchs during the month exceeded 200,000. Eight hundred and seventy-two packages of conch shells, 21 bales of sponge, 66 cases of canned lobster, and 14 live turtles were shipped to the United States during the past few weeks. The conch shell industry has been a great help to the labouring classes during the past few weeks; as many as thirty-five boats may be counted passing the office daily just about sunrise on their way to the conching ground.'



INSECT NOTES.

ON THE DAMAGE DONE BY TERMITES OR WHITE ANTS.

The termites or so-called white ants, or wood-ants, are not true ants, but get their name from the similarity of their social organizations to those of the true ants in the Order Hymenoptera. In their structure and life-history they more nearly resemble such insects as the pond-flies and the lace-wing flies. They live in large colonies, which generally have an extensive central nest containing one or more fertile egg-laying queens, and enormous numbers of workers. These queens attain a size much larger than any of the workers, because of the enormous distention of the abdomen which results from the development of the organs connected with egg-laying.

These insects are nearly always blind, and they hide from the light When it is necessary to cross an exposed surface, they build tunnels or covered galleries, through which they travel from place to place. They feed upon wood, and are able to excavate timbers and lumber used in construction, to such an extent as to render them entirely worthless. They often attack picture frames, chairs, tables, and other furniture, especially in old houses where these articles come into contact with the walls, or where they are not often moved.

Wood-ants are very difficult to control when they have become established in or about buildings. The nests can sometimes be located, and if these can be thoroughly destroyed, the numbers of the ants can be greatly reduced. These nests are often to be seen as irregular woody masses on the trunks of trees, and where they are thus found they may be cut down and removed. Domestic fowls and turkeys are very fond of these insects, and will eagerly eat them if the nests are broken up so that they are exposed. Sometimes, however, no nests can be found; but if any of their galleries can be located, many of the ants can be killed by means of poisons. A mixture of arsenic and sugar, or strychnine and sugar can be put down in these galleries as a poison bait. The insects which are killed by this are eaten by other insects in the nest and the poison becomes widely distributed. A mixture of oak or spruce sawdust and either of the poisons mentioned may also be used as a bait. If a small box containing this mixture is placed in a building where wood-ants are known to occur, and it is kept slightly moist, they will probably find it and will feed upon it. Sawdust or sheep manure in boxes, barrels, or bags, left standing on the ground for some time, is attacked by wood-ants. This fact suggests the possibility of successfully using poison baits in this manner.

In the *Agricultural News*, Vol. XIII, No. 321, for August 15, 1914, the damage caused by termites to sugar-cane in St. Kitts was referred to. There is principally one species which is now known to be *Leucotermes tenuis*, which is a South American insect. This termite does not build any nest or covered galleries either in St. Kitts, or in Barbados, where it has also been under observation. The insects attack sugar-cane cuttings newly planted in the field often completely destroying them They may also attack the ripening cane which they sometimes completely destroy over considerable areas. The remedy to employ for this pest consists in the complete destruction of all termite-infested material in the cane fields, the exercise of great care in planting only cuttings quite free from termites, and by rotation of crops. In Antigua, and sometimes also in St. Kitts, another species of termites attacked sugar-cane fields. This is *Eutermes haitiensis*, an insect which builds a large rounded nest and covered galleries through which the individuals travel. A remedial measure to be adopted in this instance is the destruction by burning of all their nests wherever found and all infested pieces of canes occurring in the fields after the crop has been harvested.

The United States Department of Agriculture (Bureau of Entomology) has just issued a Bulletin (No. 333) dealing with termites in the United States, their damage, and method of prevention. In regard to plants, reference is made to the damage which this pest can do to corn, the stem of this plant being frequently hollowed out. This damage has been observed frequently in the Southern States. Cotton has also been observed injured by termites, the insect destroying the stem about 2 inches below the surface of the soil, a hole being bored through the stem and into the heart of the plant.

The principal kind of damage, however, caused by termites, to which this Bulletin gives attention, has reference to woodwork in buildings, etc. In preventing this damage it is stated that the main point is to prevent the insect from gaining access to the woodwork from colonies in the ground, either by means of substituting rock or concrete foundations, and concrete or pile flooring in the basement, or by protecting the foundation timbers in contact with the ground by impregnation of the wood with coal-tar creosote. It is pointed out that it is very rarely possible to find and destroy the external colony, and it may be necessary to replace the foundation of the building with walls and flooring of stones, concrete, or other form of rock composition, and this is the most permanent and complete preventive. If the foundation of the building is such that damage to the woodwork is extensive and likely to recur, and it is impracticable to replace it with concrete or stone, it is advisable to replace the exposed interior woodwork with wood impregnated by a 6 per cent. solution of zinc chloride, or a 1 per cent. solution of bi-chloride of mercury; except in case of flooring in contact with the ground or in wet situations, where such preventive would leach out. In some cases thorough and repeated drenching of infested timbers, where accessible, with kerosene oil may afford temporary relief and kill some of the termites. Kerosene oil should be poured into the crevices through which the winged insects emerge from infested wood. As the insects may have entered the house through soil channels by means of pillars or the supports of perches and steps, these last should be removed if damaged, and the ground soaked with kerosene.

A Pest of the Orange Tree.—The occurrence of a pest causing injury to oranges in Brazil is recorded in the *Review of Applied Entomology*, Series A: Agricultural, Part VI. p. 201. This pest is a moth which appears to be very similar in its habits to the one which has been reported on oranges in Dominica (see *Agricultural News*, Vol. XII, No. 302, November 22, 1913).

In March and April 1915, apparently ripe oranges were found on the ground infested by the caterpillar of *Tortrix citrana*, Fern., observed in Brazil for the first time, though it is well known in California. A minute hole is made in the fruit, usually in the lower portion, and the insect enters, its presence being revealed by the expelled excreta which covers the orifice. The caterpillar grows and bores into the orange, which ripens and falls. In most cases the caterpillar carries the spores of the fungus *Aspergillus penniciilium*, with which it infects the fruits. When full-grown, the caterpillars pupate among dried leaves in cavities of the trunk; the moth emerges in three weeks. These habits are very similar to those of the undetermined Tortrix, in Dominica. In the case of the Dominica pest, the moth emerges in about two weeks instead of three weeks later, as in Brazil.

The collection and destruction by burying of all infested fruit, whether lying on the ground or in the tree, is put forward as the best method of control. In Dominica, the most successful remedy appears to be the use of arsenate of lead as a spray early in the season, in order that the newly hatched caterpillars may be poisoned as they attempt to eat their way through the orange skin.

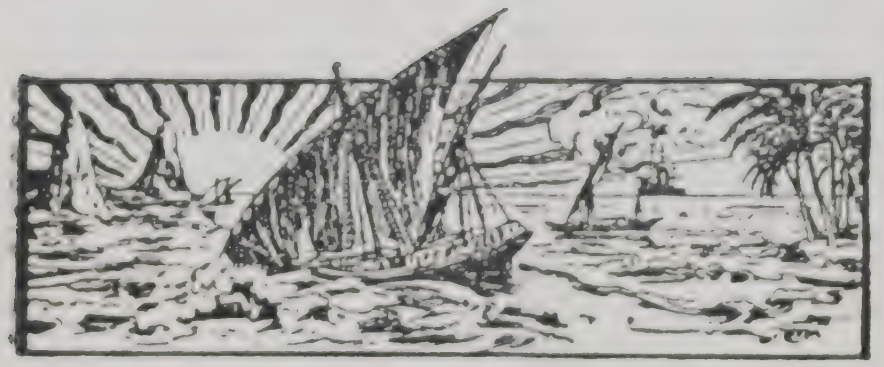
MEXICAN METHODS OF TAPPING CASTILLOA.

In the West Indian islands the Castilloa tree has not proved itself a satisfactory producer of rubber. The tree itself flourishes, but it has been found that repeated tappings result in decreased yields. Possibly the methods of tapping employed may have been partly responsible for this; in any case the following statement of the methods used in Mexico, the native home of the tree, by Mr. Ashmore Russan, will doubtless interest those who have had pratical experience in the West Indies with this rubber:—

Previously to 1903 the only tapping tool employed was the machete, a kind of sword or sabre, with a blade about 3 feet long, used for all kinds of agricultural purposes, such as chopping down trees, clearing undergrowth, making hillocks and holes for planting rubber seeds and seedlings, and for purposes of offence, as killing snakes, and, incidentally, men. A really sharp machete was, and is, rather a rarity, consequently the result of tapping Castilloa rubber trees with it was murderous. Great gashes were inflicted—anywhere, at all angles, anyhow. The deeper the cut the more latex—or so the Indian tapper appeared to think—and in consequence there are now practically no wild Castilloa rubber trees of tappable size to be found in Mexico, except perhaps in some dense and almost impenetrable forest. One would think that the murderous machete would never be used in plantations, but in 1900 and later it was the only tapping tool employed on all the estates I have mentioned, and on two or more of the estates the older trees are suffering now from its use. As to Esmeralda, it would have made little difference if the trees had been tapped with woodmen's axes. The Castilloas there, if any are still alive, merely cumber the ground.

Some ten years ago a tapping knife was evolved, I believe, on the La Zacualpa estate which is still in use. There are varieties and perhaps improvements, but all are much alike, and the principle of all is the same. The depth of the cut can be regulated from about $\frac{1}{8}$-inch upwards; the width of the cut is about $\frac{1}{2}$-inch. I have personally tried almost all kinds of tapping knives on Castilloa rubber trees, but only one, in addition to the knife now referred to, was of any utility. The exception I refer to was an exhibit at the Rubber Exhibition held at the Agricultural Hall. The name of the inventor or originator has escaped me, but he came from Mexico, and I tried his knife on some Castilloa rubber trees at that Exhibition. It may be remembered as having a handle like that of a saw, and as running on wheels. It did the work, but was not nearly so simple and effective as the knife which is in use to-day on the largest estates in Mexico. The latter is rather a murderous-looking implement, but it must be remembered that the delicate tools used for tapping Heveas are of no use whatever for tapping Castilloas, the reason, I understand, being that the latex cells of the Castilloa are long and vertical, one transverse sloping cut completely draining some 4 to 6 or more inches above it, while the Hevea latex cells are more like a honeycomb, in which the slightest paring of the bark should open up fresh cells. All Hevea tapping tools that I have ever seen are useless for Castilloa. I have tried triangle-shaped tools which would cut sufficiently deep, but the waste bark choked them up at once. Any Castilloa tool must have a free vent, with the cutting edges of the blade nearly $\frac{1}{2}$-inch apart. It must also have an extra blade for opening the cut. Such a knife makes a great gash in the tree nearly as wide as one's finger, but that would appear to be necessary, as Castilloa latex at certain times of the year would not flow readily, and has to be wiped out of the cut with the forefinger of the tapper. The depth of the cut can be regulated according to the age of the tree and consequent thickness of the bark, and this matter should be carefully attended to by the foreman or 'caporal' of the tappers before starting out; but the Mexican Indian tapper is both independent and insubordinate, and no doubt often cuts a young thin-barked tree just as deeply as he would an older thicker-barked one. I have seen prickers and hammer-chisels used for tapping Castilloas, but they were not effective, and, so far as I know, the knife described, or others on the same principle, has not been improved upon, and is not likely to be. (*From the Transactions of the Third International Congress of Tropical Agriculture*, 1914.)

It was mentioned in the previous annual report on the Department of Science and Agriculture of British Guiana (1913-14) that two beds of Ginger Lily (*Hedychium coronarium*) had been planted and that two crops, one plant and one ratoon crop, had been reaped within a year, giving a return of green stems and leaves equivalent respectively to 22 and 27 tons per acre. A second ratoon crop reaped during the year under review (1914-15) gave a return equivalent to 20 tons per acre The total return for three crops was, therefore, equivalent to 69 tons of green material per acre. Reducing this to its weight in dry material the yield for three crops in twenty months was equivalent to 8·72 tons per acre of dry material suitable for baling and shipment. The growth of the plant on the heavy clay land of the Botanic Gardens is poor as compared with the growth attained on pegassy land on the banks of the Berbice and Barima rivers, where the stems frequently attain a height of more than 5 feet.



GLEANINGS.

Dr. Stoute, of Barbados, writes to say that a breadfruit tree in Belleville recently yielded 105 breadfruit at one picking, no fruit having been picked for a week previous.

We learn from the *Port-of-Spain Gazette* that a Trinidad firm is now issuing fire insurance policies on behalf of a well-known Company, covering the risk of fire of cacao, coco-nuts and coffee trees at very moderate rates. While this is an old practice in regard to the sugar-cane, it appears to be a new departure to insure against fire for orchard crops.

The total area of regular forest plantations in Trinidad now amounts to 314 acres, against 294 last year. The East Indian teak wood, introduced from Burma in 1913, continues to do well. In a review of the Forest Department work, the *Port-of-Spain Gazette* mentions that there are 10,700 of these plants growing, and many of them are between 25 and 30 feet high.

According to the *Proceedings of the Agricultural Society of Trinidad and Tobago* for June 1916 the entire sugar-cane crop of the island has been harvested and has proved a good one, as anticipated. It is understood that large quantities of sugar were shipped in July, principally to the United Kingdom. Difficulties have arisen in regard to the shipment of coco-nuts, and large quantities remain on hand. The same applies to copra.

In regard to the action of potassium cyanamide when introduced into the tissues of a plant, the *Experiment Station Record* states that the treatment has little or no value for destroying the larger number of wood-boring insects, as the hydrocyanic acid does not travel in the cambium of the trees, but only through the old tracheæ. There is danger, too, that the use of this poison might kill the plant, particularly herbaceous and semi-woody plants.

An instructive article on the utilization of molasses as a manure appears in the June issue of the *International Sugar Journal*. It deals principally with experiments made in Java in 1911 and 1912. The results, it is believed, fully justify further trials for the utilization of this by-product as a manure. In the West Indies, quite apart from the doubtful fact as to whether molasses has any fertilizing value, it will, in most circumstances, particularly at the present time, prove more profitable to sell molasses than to use this product as a manure.

A study on the deterioration of sugars by the Bacteriological Department of the Experiment Station of the Louisiana State University and Agricultural and Mechanical College, makes it appear that neither the moisture alone nor when used in conjunction with the factor of safety, furnishes a reliable criterion of the keeping quality of the sugar, but that its degree of infection must also be taken into consideration. The study is to be continued with particular reference to the influence of the non-sugars upon deterioration, and of the influence of moisture and acidity.

It is learnt from the report on the Agricultural Experiment Station of the University of Florida for 1914, that several experiments have been carried out to ascertain the amount of velvet beans that can be profitably fed to hogs for pork production. As a check on this line of investigation a portion of the herd was fed on corn only. Other lots have been fed different mixtures of corn and velvet beans The results indicate that the largest increase in weight would be made when the ration is composed of 3 parts of corn to 1 part of crushed velvet beans by weight.

An investigation into the factors affecting the cooking of dhall or pigeon pea (*Cajanus indicus*) is described in the *Memoirs of the Department of Agriculture in India*, Chemical Series, Vol. IV, No. 5, April 1916. It has been found that dissolved salts, such as are found in natural waters, exert a marked influence on the time taken to cook these peas. The addition of sodium bicarbonate or carbonate to a hard water materially hastens the cooking. It is possible that this holds good for most vegetables. It is stated that the rate of solution of the proteid or nitrogenous matter appears to be the factor which mainly controls the rate of cooking of pigeon peas.

An interesting account of the natural vegetation of the Isle of Pines, Cuba, is given by Dr. Britton in the *Journal of the New York Botanical Garden*, for May 1916. Amongst many other matters, reference is made to the occurrence of three kinds of maiden-hair ferns in a certain area associated with the remarkable colony of *Blechnum occidentale*, many thousand plants being densely packed together in a notch between two wooded hills, occupying an area of perhaps 2 acres. It is urged that this beautiful spot is well worthy of permanent preservation for the enjoyment of residents and tourists.

A preliminary study of Philippine bananas will be found in the *Philippine Journal of Science*, Vol. X, Sections C (Botany) No. 6, for November 1915. The general conclusions drawn are that there is urgent need for a thorough 'botanico-pomological' study of bananas and plantains, especially the cultivated varieties. It is stated that the characters of the flowers will clearly identify the varieties, quite apart from fruit characters. Many of the varietal names in current use are synonymous. There are eleven species and twenty seven varieties of the genus Musa reported from the Philippine Islands. It occurs to us that agricultural officers in Jamaica, Trinidad and British Guiana, may be interested to compare their collections with the descriptions given in this important paper.



ST. LUCIA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1915-16.

In the Botanic Gardens, situated at Castries, the capital town of this island, the question of the reconstruction of the main roads, with a view to making them accessible for driving, was dealt with during the year. At the Experiment Station at Réunion estate, the usual work connected with the raising and distribution of plants was carried on: during the year 52,058 plants were sent out, which compares favourably with the number distributed in previous years. Most of these plants consist of lime seedlings. The report then gives some interesting notes on ornamental and economic plants, amongst which may be mentioned *Kokia rockii*, an interesting plant closely related to the cotton plant; and the camphor which yields the camphor of commerce. The investigation started in the previous year with a view to determining the different species of St. Lucia grasses was continued during the present period, and thirteen of the specimens proved to be new records. Several species of sedges were also named. Assistance in this work of determination was kindly given by the United States Department of Agriculture.

In regard to plot experiments at the Botanic and Experiment Stations, reference is made to an experimental plot of Bay trees, planted for the purpose of ascertaining the actual yield of oil from cultivated trees as compared with trees growing in a wild or semi-wild state. A large number of other plots were cultivated during the year under cotton, sugar-cane, limes, ground-nuts, etc. Work was done in the matter of grafting mangoes and budding oranges.

In regard to pest and diseases, the necessity for legislation against dodder and mistletoe is mentioned. Action has been taken to prevent the importation of citrus canker, which is prevalent in the United States. A list is given of the principal pests and diseases together with the host plants, which are commonly met with in St. Lucia.

Turning to progress in the chief industries, it is stated that the total value of sugar and its by-products exported during the year reached the sum of £89,466, this being an increase in value over the exports for the previous year of £43,187. This great increase is chiefly due to the general advance in prices, but there was some slight increase in production. Turning to cacao, the need for greater attention in the matter of tillage, drainage, liming and mulching on estates is strongly emphasized. If better care were exercised, there is no doubt that the output of cacao from St. Lucia would be much greater than it is, namely, about 18,500 cwt. The exports since 1891 are plotted to form a curve which possesses very interesting features. The rapid rise in the exports during the period 1900-6 is very marked, and would appear to be, at least in part, the result of increased attention given to the cultivation of cacao, as the result of the activities of the local Agricultural Department, particularly in regard to agricultural instruction. The comparatively stationary condition of the industry in recent years may be regarded as being partly due to the increased attention that has been given to the growing of limes.

Turning to the cultivation of limes, it is stated that the total lime products exported during the year were valued at £7,312. The Agricultural Superintendent is not satisfied with the output of limes in comparison with the area that has been planted. He considers that the relatively small output indicates that lime cultivation has not been given proper care and attention. This may be due in some cases to the planter putting in more limes than he is conveniently able to care for. In other cases it may be due to sheer neglect, and failure to attempt to apply manures, particularly vegetable mulch. The question of the budding of limes is dealt with on the basis of information from Dominica.

There has been a satisfactory extension of the area under coco-nuts during the year: young groves are in healthy condition and show every promise for a successful industry in the future. Other minor industries of the Colony include honey and fruit, and drugs and spices. There has been a reduction in the value of all these exported during 1915, compared with 1914.

In regard to agricultural education, it is stated that work in the elementary schools has compared favourably with that of previous years. Concerning work in the country, agricultural instructors whose duties should be to visit estates and peasant holdings and give practical demonstrations and advice are urgently needed. The position is at present, that the existing staff are so taken up with experimental and administrative work, that they have little time at their disposal to devote to agricultural instruction.

An interesting feature of the year under review was the passing of an Agricultural Credit Societies Ordinance similar to the one in force in St. Vincent, for the encouragement and assistance of unlimited credit societies under the Raiffeisen system. Several of these societies have been started. Another economic feature of the year was the movement made with a view to providing Crown lands for ex-service men.

The Government lime juice factory passed through a successful year, the profit made by the Government being £128 as against £13 for the year 1913-14. The total receipts were £1,217, and the total working expenses £528. The profits for distribution in the form of bonuses to vendors amounted to £560. The standard of quality of the concentrated juice has been maintained at a satisfactory level. The average sediment in the juice was 2·5 units. The crushing was better than last year, though the juice was not so rich in acid. Prices were maintained at a satisfactory level.

In regard to extension of interest in agricultural products, reference is made to the possibilities before the cultivation of camphor, Robusta coffee, logwood, ajowan (for the production of thymol), and peas and beans. A scheme for purchasing beans and peas by the Government on a profit-sharing basis has been introduced.

The report contains a considerable number of meteorological statistics. The year under review proved to be the wettest recorded for the last twenty years. The rainfall at the Castries Botanic Gardens for 1915 amounted to 116·20 inches, being 48·60 inches in excess of the preceding year, which was the driest year on record.

Readers interested in gardening will find a useful list of roses suitable for the West Indies towards the end of this report.

The publication closes with a report on the working of the Land Settlement Scheme at Réunion. Six new holdings were sold during the year under review, making a total of thirty-six sold out of the original total of forty-six.

A DESCRIPTION OF THE ISLAND OF BARBUDA.

The following interesting account of Barbuda appears in the Report of the Agricultural Department, Antigua, for 1914-15.

The island of Barbuda is a dependency of Antigua, and lies about 30 miles due north of that island. It has an area of about 65 square miles; it is owned by the Government, and is worked as a Government plantation and stock estate.

The island is very flat, the highest point being only 20 feet above sea-level; the soil is for the most part shallow and rocky, but considerable areas of fertile land exist. The rainfall is low, averaging about 41 inches per annum. The population at the last census was 871.

Formerly the island was regarded as possessing very little agricultural value, but of recent years the development of cotton cultivation has proved that the reverse is the case. Under Government auspices during the past thirteen years from 100 to 150 acres of land have been annually cultivated under cotton, and satisfactory returns experienced. In connexion with the cotton industry, a small ginnery containing two gins, a baling press, and a 4 h p. Hornsby oil engine is maintained and worked.

In addition to the cotton cultivation, the stock farm is maintained on which are raised horses, cattle and mules. In this connexion pastures are kept clear of bush, water-supply by means of wells provided, and paddocks and enclosures maintained, while two thoroughbred stallions and two jack donkeys are kept for service.

Apart from the stock owned by the Government, a large number of animals exist which are owned by the peasantry; these enjoy in return for the payment of a small annual licence the use of the Government stallions, pastures, water-supply, and paddocks.

In addition to cotton cultivation, areas are each year planted by the Government under maize (Guinea corn) and other fodders, mainly for use as fodder for the stock, while about 80 acres in the north part of the island, have been planted in coco-nuts during the past two years, under the advice of the Agricultural Department.

The Department has throughout advised in connexion with the agricultural work as required, while of late years at the request of the Government, regular yearly visits have been paid to that island by the Superintendent of Agriculture.

A series of cotton selection plots has been instituted by the Management in co-operation with the Department of Agriculture, the field selections being performed by the manager, while the examinations of the lints from selected plants are carried out in the Government laboratory. It is hoped that systematic work of this description will result in raising the quality of Barbuda grown lint, which in past years has been somewhat below the average, and signs are not wanting that this is being accomplished.

In other ways the Department has assisted in the work of the plantations by advice as to cultural methods and the control of insect pests, analyses of soils, manures, feeding stuffs, and waters, and the supply of planting material for experimental and other purposes.

Towards the end of the year under review, the Superintendent of Agriculture was instructed to make a special

island, since of recent years some difficulties ha experienced in this connexion with the increase in p of the inhabitants.

It is not out of place to add that the present co undertakings were inaugurated in 1903 as a m relief work to the people of the island, who were th extremely poor condition, the cultivation of cott assisted by a grant from the British Cotton Growin ation. From these beginnings a substantial prosp arisen, the surplus of assets over liabilities on March being £2,473 18*s.* 8½*d.*

It might be added that in Barbuda good shoo fishing are afforded and the island is frequently v sportsmen for those purposes. In connexion with might be added that there are possibilities regarding mercial development of the shallow-water areas ar island in the direction of sponge cultivation a industries.

A New Tree.—A sample of seed belonging known as Quebracho colorado (*Quebrachia Lorentzii* received from the Director of the Royal Botanic Gard This is a large forest tree, native of the Argentine, very hard and durable wood is used for railway slee bridges, beams, etc. From the wood reduced to chip like extract is obtained. This is exported to the nearly 100,000 tons a year to the United Kingdo States, etc., for tanning purposes. A tanning e a finely powdered condition is also imported country [United Kingdom] from the Argentine, an ing to a recent Consular report, the wood in a market in Russia.

In view of the closer association between th Institute and the Colonial Office which has just bee the report on the work of the former institution particular interest at the present time. The sta the work done is arranged under geographical Investigations conducted for the West Indies hav work on minerals from Grenada, oils and beans f serrat, agave pith and manchineel fruit from Antig from Dominica, banana meal from Jamaica, and ti sponges from the Turks and Caicos Islands. Th Institute is of much value in respect of its close with the manufacturers of raw material in Gre The report under notice indicates that a large work has been accomplished during 1914, parti regard to the West African colonies.

DEPARTMENT NEWS.

The Imperial Commissioner of Agricu Barbados on August 23 by the C. R. M. S. for Antigua, with the object of paying an o to that island. Dr. Watts is expected to Barbados in about one month's time.

Mr. W. Nowell, D.I.C., Mycologist on th the Imperial Department, returned to Barb C. R. M. S. 'Chaleur' on August 23 from where he has been engaged in certain in

A NEW DRUG PLANT FOR THE WEST INDIES.

This Office has recently received a consignment of seed ly forwarded by the Director of the Royal Botanic ens, Kew. This is the seed of *Hyoscyamus muticus*, Egypt. It is intended to experiment with this seed in in districts in the islands, with a view to growing the t for the alkaloid it contains. This alkaloid is similar tropine, which is a most important drug, and one the ly of which has been greatly restricted owing to the tion of Germany. Plants received last year by the erial Institute from Egypt were found to contain 0·64 cent. of alkaloid on the dried material, while according to *Agricultural Journal of India* (for January 1916), plants *Hyoscyamus muticus* in India have been found to contain 3 per cent. of alkaloid on the dried material.

Hyoscyamus niger—the English Henbane—also yields alkaloid, but it does not yield anything like so high ercentage, and the alkaloid does not appear to be so pure.

It is stated in the *Bulletin of the Imperial Institute* that re is a strong demand for this plant on the part of nufacturers, and its establishment in the West Indies ght lead to a new minor industry and without interfering h existing cultivations, for this plant grows wild and ght flourish in these islands where ordinary crops would se to grow.

IRRIGATION IN ANTIGUA.

It is stated in the last Report of the Agricultural partment in this island that during 1914-15, the preliminry work in connexion with an experiment in irrigating gar-cane was performed. The plot on which this work is nducted is situated on Bendals estate, and is 1 acre in a. Of this, half will act as a control plot, and the other f will receive irrigation water. The plot is situated near tream across which a dam was built, and from this water pumped into a tank and led on to the plot by means of anvas hose-pipe.

It is assumed that 1 inch of rain per week is sufficient ensure a steady plant growth, and the irrigation water is plied to supplement the rainfall. For instance, when no n falls during any one week, water equal to 1 inch is plied; this amounts to 12,000 gallons; when $\frac{1}{2}$-inch falls, f this quantity is applied, and when $\frac{1}{4}$-inch falls, three-arters is put on.

A sample of water from the dam which is used for gating, is periodically sent to the Government laboratory analysis.

The results obtained from this experiment, soon to be plished, will be of interest, and if they justify such procedure, it is probable that in the future larger areas l be experimented with.

We have been notified that the Order made by the vernor-in-Executive Committee in Barbados on May 20, 15, in regard to prohibiting the importation of cotton d from certain countries, has been hereby amended to effect that seed will now be admitted from the United tes of Colombia. This amendment will probably have effect of lessening the present scarcity of cotton seed al and may possibly result eventually in a fall in price m the present high level.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of July:—

The month of July commenced with a very restricted amount of business both in drugs and spices, owing chiefly to the occurrence of the general half-yearly stock-taking. Throughout the month there has been distinct evidence of purchasers restricting the quantity of goods purchased rather than a diminution in the bulk supplied, except in few instances.

There has been a distinct drop in citric acid since our last report.

In the spice market ginger, nutmegs, and mace have occupied little or no attention the prices remaining similar to those in our last report.

SARSAPARILLA.

In the early part of the month sarsaparilla was in good supply, the quotations being 1*s.* 9*d.* to 1*s.* 10*d.* per ℔. for grey Jamaica, 1*s.* to 1*s.* 2*d.* for native Jamaica, and 1*s.* 6*d.* to 1*s.* 7*d.* for Lima. At the last auction on the 27th, the several kinds were in steady demand at the following rates: 23 bales of grey Jamaica were disposed of at from 1*s.* 6*d.* to 1*s.* 10*d.* per ℔. for common to good grey; 14 packages of native Jamaica realized 1*s.* to 1*s.* 1*d.* per ℔. for dullish to fair red, while dull yellow to dull red fetched $9\frac{1}{2}d.$ to $10\frac{1}{2}d.$; 40 bales of Lima were disposed of at this auction, at from 1*s.* 2*d.* to 1*s.* 5*d.* per ℔.

CITRIC ACID, PIMENTO, TAMARINDS, LIME JUICE, ANNATTO SEED, AND KOLA.

As before stated, citric acid has been declining during the month. In the first week it was in very slow demand at 3*s.* 8*d.* to 3*s* 9*d.* per ℔. A fortnight later it had dropped to 3*s.* 6*d.*, and at the close to 3*s.* 5*d.* per ℔. Pimento, for which there has been a very slow demand, was quoted at 3*d.* per ℔. at the beginning of the month, since when there has been no change. Tamarinds also have been very quiet, fair West Indian, duty paid, being disposed of at 24*s.*, and black Calcutta at 28*s.* per cwt. Probably in consequence of the unseasonable weather there has been very little demand for lime juice, which has stood at from 3*s.* to 3*s.* 3*d.* per gallon; quite at the end of the month, however, it had advanced 3*d.* to 3*s.* 6*d.* for good West Indian. At the last auction on the 27th of the month annatto seed was represented by 5 bags of fair bright Ceylon, which were disposed of at $7\frac{3}{4}d.$ per ℔., and at the same auction 2 bags of small to medium fair West Indian kola were sold at $6\frac{3}{4}d.$ per ℔.

The financial position of Trinidad is dealt with editorially in the *West India Committee Circular* for July 27, 1916. This clearly shows the great prosperity which this Colony is experiencing in spite of the trade interruptions due to the war. The value of the cacao shipped during 1915 was £1,865,266 or 54 per cent. of that of the total exports, as against £1,070,423 for sugar and its by-products, rum and molasses. The export of petroleum was hampered by the scarcity of oil ships, but the exports were nevertheless greater than last year. The transhipment trade with Venezuela was carried on with greater activity.

MARKET REPORTS.

London.—The West India Committee Circular, July 27, 1916

Arrowroot—2½*d.* to 2⅞*d.*
Balata—Sheet, 3*s.* 5½*d.*; block 2*s.* 9½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 82/-; Grenada, 73/- to 78/-; Jamaica, full rates.
Coffee—Jamaica, no quotations.
Copra—£31 5*s.* to £32 5*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/6 to 3/6; concentrated, £23; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—4*d.* to 3*s.*
Nutmegs—9*d.* to 2*s.* 8*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/10; fine soft, no quotations; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Joffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 17, 1916.

Cacao—Venezuelan, $17·00 to $17·25; Trinidad, $16·50 to $17·00.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$5·50 per 100 lb.
Dhal—No quotations.
Onions—$4·00 per 100 lb.
Peas, Split—$11·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $7·50 to $7·75; White., $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch Ltd., & Co., July 26, 1916; T. S. Garraway & Co., August 8, 1916

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·85 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $105·00 to $110·00 per ton.
Molasses—No quotations.
Onions—$3·55 to $5·00.
Peas, Split—$11·50 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, no quotations.
Rice—Ballam, $7·55; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, July 31, 1916; Messrs. Sandbach, Parker & Co. June 30, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	5c. per lb.
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	12c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$6·75 to $7·00	$7·50 to $7·7
Green Dhal	——	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	2½c.	$9·00 to $10·00
Madeira	——	——
Peas—Split	$12·00 to $12·50	$12·00 to 13·0
Marseilles	——	per bag. (210 lb. ——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	——	$4·80 to $5·0
Lisbon	——	——
Potatoes--Sweet, B'bados	$2·40	——
Rice—Ballam	$7·00 to $7·25	——
Creole	——	$6·75 to $7·00
Tannias—	$2·40	——
Yams—White	$2·64	——
Buck	$2·64	——
Sugar—Dark crystals	$4·50 to $4·60	$4·50 to $4·6
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. pe cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Further Argument for Agricultural Colleges.

IN Volume I of the Transactions of the Third International Congress of Tropical Agriculture, held at the Imperial Institute during June 1914, will be found the papers that were read on the subject of agricultural education. Taken as a whole, it cannot be said that these communications lead us very much farther ahead, particularly in connexion with the much-discussed question of tropical agricultural colleges. That these institutions are needed appears to have been generally recognized at the Congress, but no suggestions were made as to carrying the idea into effect. The outbreak of war., a month later, naturally had the effect of causing a complete cessation of public interest in the matter, but during the past two years, the extraordinary revelations which the war has produced in regard to showing the national importance of science, has tended to revive public interest in the matter, and there is every possibility that this will increase in the future.

The relative importance to Great Britain of her tropical possessions would appear to become greater and greater the longer the war continues, and in this fact would appear to lie one of the strongest arguments for the immediate provision of better educational and research facilities. In the case of cotton, we observe a very ominous development of the spinning industry in the United States and the increasing home consumption of the raw material produced in that country. It would appear—and the matter has been openly admitted by the British Cotton Growing Association—that Lancashire's supply of cotton will have to depend more and more upon production within the Empire, and this will mean a very large extension of the cotton growing areas. In order to compete with the home consumption of raw cotton in the United States, this British-grown cotton will have to be produced cheaply especially in view of the further handicap of heavy freight charges.

Another kind of raw material which constitutes an important tie between Great Britain and the tropics is rubber. The amount of British capital invested in rubber plantations is very great indeed, and no matter whether this rubber is shipped to British or American manufacturers it is of the greatest importance to maintain high dividends by reducing the cost of production and by the prevention of undue depreciation on the estates.

In regard to sugar, also, there are signs that the economic connexion between Great Britain and the tropics will be strengthened. Political action will probably be taken to secure a larger supply of British-grown sugar than in the past; but the most satisfactory way and probably the only way of increasing the amount of British-grown sugar will be by reducing to the lowest possible point the cost of production so as to enable the British colonies to compete with foreign rivals—both beet and cane—if necessary in the open market.

In the case of all three of these raw materials future progress appears to depend upon efficient production. Efficient production means the application of science in its widest and most practical sense—in improving soil fertility, in fighting diseases of plants, animals and man, in training labour, in introducing improved implements and machinery, in breeding better plants, in improving transport facilities, and in being methodical and economical in every direction.

To carry this into effect requires an elaborate educational organization. It is not sufficient to educate one class of worker connected with a great industry and neglect another. Labour needs instruction in manual operations and in co-operative action; the estate manager needs training in the principles and practices of crop production, in labour management and business matters and requires further to possess a good general knowledge of the sciences underlying the art he practises; even the capitalist whose money is invested in tropical agriculture requires a sound theoretical knowledge of matters relating to the crop in which he is interested in order that he may see the wisdom of adjusting expenditure in order to achieve maximum efficiency. A fourth class to be provided for is comprised of the scientific expert who works in an advisory capacity with the actual producers and is generally maintained by the State. Further provision must be made for training the research worker whose ultimate duty is to investigate more or less abstract problems of science without regard to their immediate practical importance. On the work of the research student, the expert is largely fed and through him fresh information filters down to the estate manager until it eventually finds its application in estate practice.

The scientific workers require specialized courses of academic study in contra-distruction to the general course of technical study needed by the planter himself, or the specialised manual and moral training required by the labourer.

To provide these systems of education in the tropics it is necessary to have agricultural colleges, or at least some definite extension of the educational side of the present Government Agricultural Department in the more advanced colonies. Considering the great diversity exhibited in tropical agriculture even in the cultivation of one and the same crop, all the functions of a college as outlined above could not be fulfilled by a single institution to serve the tropics as a whole. It would probably be found that several colleges situated in different places and affiliated to a central institution in Great Britain would answer best. The work of each in a sense would probably tend to become specialized in so far as it would have regard to one staple crop more than another. Thus one can conceive of an agricultural college in the West Indies becoming renowned as a centre for the study of sugar production, of another in the Federated Malay States for the study of rubber just as in England one agricultural college is noted for its natural facilities for teaching stock farming and another for instruction in cereal production.

There can be no doubt that the establishment of such institutions of education and research in the tropics would quickly have an educational influence of a far-reaching kind, and soon have the effect of strengthening the trade relations between the tropics and the Mother Country.

EXTENSION OF SUGAR-CANE CULTIVATION IN JAMAICA.

The July issue of the *Journal of Jamaica Agricultural Society* contains the report of the Committee appointed to enquire into the amount of land available for sugar cultivation in that colony. About 85,000 acres are regarded as being immediately capable of being put under sugar-cane. The report continues:—

How much sugar can be produced from this area depends on the efficiency of its cultivation and upon the completeness in power equipment and management of the factories which would have to be erected.

Assuming these to be satisfactory, the output of sugar may be estimated at from 150,000 to 200,000 tons per annum in addition to the present production, most probably the higher amount as no account has been taken of the canes

which may be supplied by small settlers, as they now grow 32 per cent. of those under cultivation, it is certain that they would greatly extend their operations as soon as a means of disposing of the canes profitably is established.

It is very desirable that sugar cultivation should be extended on a large scale not only as a means of developing the country and of enriching its inhabitants, but for the purpose of re-establishing trade with the mother country, and of developing it with Canada, instead of depending almost entirely on trade with a foreign country.

The extreme susceptibility of fruit to destruction by hurricane or even by moderate gales renders the banana industry subject to frequent and serious disasters, and the extension of sugar cultivation one of the staple crops of the world would exercise a stabilizing effect on the financial affairs of the colony.

In order to ensure the best results careful organization and the command of capital are essential, and in the face of the hopeless struggle of planters in the past against the conditions brought about by the fiscal measures of the Mother country and the stimulation of beet production on the Continent by bounties, unassisted individual effort would not be capable of securing the capital required from Great Britain.

The present indications are that if anything considerable is to be done by private enterprise it will be accomplished by American capitalists who already control the banana and coco-nut industries.

In these circumstances the committee recommend pressing on the Government the advisability of controlling the industry by erecting Government factories, debentures being issued for the purpose, and arranging with cane farmers (large and small) to sell canes to the factories on a $4\frac{1}{2}$ or 5 per cent. basis plus 75 per cent. of the nett profits, after paying the working expenses, interest on capital invested, 2 per cent sinking fund, and 5 per cent. for depreciation, the remaining 25 per cent of the profits accruing to General revenue (on a sale of canes on a 5 per cent. basis the planter would receive 12*s.* per ton for canes when the price of sugar is £12 per ton.)

That such a scheme would pay with a £2 10*s.* preference as suggested by the West India Committee seems assured in view of the experiences of the Antigua factory where, without preference, after manufacturing 50,474 tons of sugar and having paid £19,673 in interest and £41,000 in redemption of debentures and as a sinking or reserve fund, £34,113 was added by way of half profits to the prices paid for canes and a like amount paid over to the shareholders of the factory.

In considering the question of a preference the Committee thinks it opportune to tender a few remarks.

The average sugar crops of German and Austria Hungary are:—Germany, $2\frac{3}{4}$ millions; Austria-Hungary, $1\frac{3}{4}$ million tons. That is $4\frac{1}{2}$ million tons.

Even although production may have been reduced during the war, there will probably be a large accumulation of unconsumed sugar ready to be dumped on the markets of the world at the close of the war.

If safeguards are not provided the effect of this wholesale dumping will be serious. The safeguards should be such as not merely to protect British producers against the post-war dumping, but to encourage the production of sugar in the Empire so as to render it independent of enemy production.

Mr. Hughes, the Premier of Australia, suggests an agreement by the British Government to purchase from each colony up to a named quantity at a minimum price.

The consumption in Great Britain is considerably over one million, and of Canada about 300,000 tons per annum.

THE JAVAN SUGAR CROP, 1915.

Dr Prinsen Geerligs' European News Letter in the *Louisiana Planter* (July 22, 1916) contains the following information relative to the Javan sugar crop for the year 1915:—

'The area planted with cane for the year 1915 amounted to 373,515 acres against 364,380 acres in 1914, thus showing an increase of 9,135 acres or 2·5 per cent. The number of active factories was 186, or the same number as in the year before.

'The total sugar production amounted to 1,298,307 long tons, against 1,382,816 in 1914 and 1,442 884 tons in 1913. This shows a steady decrease in the total production, notwithstanding the slightly increased sowed area.

'This sad fact is due both to a poor tonnage and a poor rendiment, as the output of cane on an average over the whole island in 1915 was only 95,386 kilos per hectare or 38·25 long tons per acre, against 40·2 tons of cane per acre in 1914 and 41·42 in 1913.

'The rendiment of sugar, calculated as refining crystals of 96·5 polarization in 1915 was only 9·15 per cent. against 9·28 per cent. in 1914 and 9·56 per cent. in 1913. This brings the total sugar production on an average over Java for 1915 to 8,729 kilos per hectare or 7,840 lb. per acre, against 8,512 lb. per acre in 1914, and 8,950 in 1913.

Next to this amount of sugar the island exported no less than 129,585 tons of solidified molasses, while the figure for that exportation during 1914 was 96,281 tons, and 66,809 in 1913. This shows quite a doubling of the exportation of that by-produce in two years' time. The assortment of the sugar delivered was: white plantation sugar, 48 per cent.; refining crystals, basis 98 polarization, 35 per cent.; refining crystals, basis 99 polarization, 14 per cent.; seconds 0·4, thirds 2·1 and fourth sugars 0·5 per cent. Half of the production of first sugar has, therefore, been made in plantation whites destined for direct consumption, while the other half had to undergo a refining process before entering into consumption. The total percentage of first sugars was 97 per cent. and only 3 per cent. after-products, really a very fine proportion, doing credit to the skill of the manufacturers. One factory has made more than 25,000 long tons of sugar, three made between 15,000 and 20,000, twenty-six between 10,000 and 15,000 tons, the greater part of the establishments, viz. 109, produced between 5,000 and 10,000 tons, while the balance of forty-seven establishments made under 5,000 tons.

The biggest output per hectare is mentioned from Sempalwadak, viz. 12,941 kilos per hectare, while the next best, which made white plantation sugar only, the Bantoo estate, produced 12,802 kilos of that description per hectare, equivalent with 5·10 long tons per acre. From other sources we learn the following data about the quality of the cane in that island during 1915. The percentage of sugar in the cane was again lower than in any former year, this time being only 11·63 per cent. while in the already reputedly bad year 1914 it had been 11·91. The quotient of purity of the raw juice was, however, slightly better being, on an average, 82·0 against 80·4 in 1914.

The fibre content of the cane was higher than in any other year, but that may depend on the new method for determining that figure, giving better values than the former ones, which were always too low. The quotient of purity of the final molasses is slightly over 32 points, a very good result of the factory work.

THE HISTORY OF RUBBER.

In *Science Progress* for July 1916 appears an interesting and instructive article entitled, An Historical Sketch of the Chemistry of Rubber. The first half of this article gives an account of the history and the introduction of rubber into domestic uses, while the latter half deals essentially with the chemical composition of rubber.

The first rumours of the existence of rubber are said to have reached Europe after the second voyage of Columbus to the New World in 1493-4. Stories were brought over to the effect that the natives used it to make playing balls, waterproof boots etc. In 1731, a French expedition led to an exhaustive enquiry into the source and preparation of rubber in Peru and Brazil and an account was communicated to the Academie des Sciences in 1751. The first chemical study of caoutchouc was published in 1763, but the substance appears to have remained a mere curiosity in Europe, until in 1770 Priestly, the discoverer of oxygen, suggested its use, under the name of India rubber, for erasing lead-pencil marks. And this for many years was the main purpose to which it was devoted. Later the French used a solution of rubber in turpentine for coating balloons but it was not until about 1825 that Macintosh discovered the solubility of rubber in naphtha, and successfully applied the solution to the fabrication of waterproof garments, from which time the modern rubber industry may be said to have commenced.

The fact that rubber goods were extremely subject to the influences of the seasons nearly caused a collapse of the whole industry; this however was averted by an American named Goodyear, a chemist of Connecticut. After suffering much hardship in prosecuting his research, and even undergoing imprisonment for debt, he was rewarded in 1839, by the discovery of the process of vulcanization which overcame influence of seasonal changes and adapted rubber to countless purposes of mankind. The result was attained by heating the gum with an admixture of sulphur at a high temperature.

The greatest impetus the rubber industry ever received was undoubtedly given by the reinvention in 1888 of the pneumatic tyre. An air-filled tyre for use with carriages had been patented by Thompson in 1845, but, partly owing to faulty construction, and partly because its advantages at low speeds were not sufficient to counterbalance the high cost of the large tyres employed, the invention was allowed to drop. The advent of the safety bicycle, with small wheels to which springs could not easily be attached, led Dunlop independently to discover and patent the idea.

The introduction of rubber tubing proved to be of great benefit in chemical research, since it obviously facilitated the arrangement of communications between various vessels. Before rubber tubing was used, a lute made of a paste of clay and linseed oil was wrapped around the glass tube connexion. The introduction later of the rubber cork was also of great service in chemical experimental work

In regard to the chemistry of rubber, it is not our object in this note to deal with the subject at any length. Suffice it to say that caoutchouc is a polymer of isoprene from which rubber can be produced synthetically. Isoprene is prepared in large quantities from fusel oil. The most dramatic incident in the race between the English and German firms in regard to synthetic rubber was the almost simultaneous discovery of the value of sodium as a polymerizing agent. It was found in both countries that sodium causes the change to take place quickly, and practically quantitatively, at a low temperature. While possessing the same physical properties as synthetic rubbers produced by other methods, the rubbers obtained by the action of sodium appear to have a somewhat different chemical constitution. This, however is of little concern to the manufacturer, providing the material will answer his practical purpose.

As the result of the researches on synthetic rubber, it is hoped that before long it will be placed on the market.

REPORT ON THE WORKING OF THE ANTIGUA GOVERNMENT GRANARY, 1915.

We have received from Dr. H. A. Tempany, Superintendent of Agriculture for the Leeward Islands, a copy of the annual report on the working of the Antigua Granary for 1915.

Under the scheme for operating the Government Granary, it was arranged that cob corn should be purchased on a co-operative basis, a first payment being made for corn on delivery, while any subsequent profits after paying the cost of working expenses should be divided between the grower and the granary, in the proportion of 75 per cent. to the grower and 25 per cent to the granary.

It was agreed that the magnitude of the first payment should be based on the current market price for corn, and for the first period of working this was fixed at 6*s.* 1*d.* per 112 lb. for corn on the cob delivered at the granary.

The value was arrived at on the assumption that the corn cob supplied to the granary would yield, on shelling, from 73 per cent. to 75 per cent. grain with a moisture content of 16 per cent.

Buying operations in this connexion commenced at the end of July 1915, and terminated in October 1915. Drying proceeded till the end of October, and the whole of the corn had been disposed of by the end of December.

In all 109,987 lb. of cob corn were purchased, the expenditure on purchase amounting to £298 18*s.* 10*d.* Corn was purchased from fifty-two dfferent growers.

From the operation 67,032 lb. of kiln-dried corn were obtained the net proceeds from which realized £315 3*s.* 4*d.*, or an average of 10*s.* 6*d.* per bag of 112 lb.

The expenditure on working expenses in labour, fuel and materials came to £37 9*s.* 9*d.*, while an additional charge of £13 17*s.* 10*d.* was incurred for bags. This does not include any charge for interest on invested capital, or for rent and insurance.

It will be seen that a loss of £35 3*s.* 1*d* was incurred on the transaction, consequently no bonus could be paid.

The actual shelling percentage of the corn worked out at 65 per cent.; the average moisture content of the corn when purchased was 18·3 per cent.; after drying it was 10·6 The actual recovery of kiln-dried grain amounted to 60·9 per cent. on the cob corn; this is very small and decidedly below the expected yield. The average moisture content of the corn was also very high and operated in favour of the producer. These two factors are very largely responsible for the result.

Corn sales extended from September until December, and as no corn was imported into the island during this period until near the end of December, it is obvious that the corn sold to the granary represents an overplus of production at the time the corn was reaped which, if the granary had not been in existence, would probably have been subject to considerable loss on storage.

The following is a summarized statement of the position:—

Total weight of cob corn purchased	109,987 lb.
Total amount paid	£298 18*s.* 10*d.*
Price paid	6*s.* 1*d.* per 112 lb.
Total number of persons from whom bought	52
Kiln-dried corn sold	67,032 lb.
Price realized	£315 3*s.* 4*d.*
Average price per 112 lb.	10*s.* 6*d.*
Expenditure on bags	£13 17*s.* 10*d*
Expenditure on labour and materials	£37 9*s.* 9*d.*
Loss on transaction	£35 3*s.* 1*d.*
Per cent. kiln-dried corn on cob corn	60·9
Moisture per cent. wet corn	18·3
Moisture per cent. dry corn	10·6
Moisture per cent. loss	7·7
Shelling per cent.	65·0

GROWING WRAPPER TOBACCO UNDER SHADE.

In the *Philippine Agriculturist and Forester* for June 1916, are recorded the results of interesting work done in the production of cigar wrapper tobacco under shade at the College of Agriculture in the Philippines. The object of the work may be considered as the testing under shade of the native Cagayan, Tirona Hybrid and the acclimatized foreign varieties—Turkish Lowland, Vuelto Abajo, Sumatra, and Texas Cuban—to find out in a preliminary way what their respective possibilities are in the production of wrapper leaves under Philippine conditions, as compared with leaf produced in the open field.

The cultures were located on a very slightly inclined piece of ground by the Molawin River, some 40 feet above the river level. The soil is rather heavy and had never been used before for tobacco, although other crops such as rice and sugar-cane had been cultivated on it; and the mere fact that it is not specially adapted for growing wrapper markedly served to show the effect of the cheese-cloth cover.

The seed used in the present work was obtained from the varieties above mentioned, the object of including so many varieties being to find out which ones would profit best by shade culture, and which would not. The seeds were sown in carefully prepared wooden flats in September 1915, and the seedlings transplanted into prepared seed beds about two months after in November at distances 4 c.c. part each way, which proved sufficient for the purpose.

The shade tent was built to cover an area of 774 square metres, or about one-thirteenth of a hectare. The cloth used for cover was not of the special weave in common use in America, but the same fabric as is commonly used in the making of mosquito nets. The area under shelter was divided into six plots varying in size according to the number of seedlings available at the time of replanting. Outside the tent, check plots were laid out corresponding to the number of plots inside.

All the leaves being especially produced for wrapper, harvesting was done by priming, or the act of removing or gathering the leaves singly from the stalk as they severally reach the proper degree of ripeness. Harvesting began in February 1916, and the difference in appearance of the leaves inside and outside the shade tent was so obvious that it seemed as if the outside leaves were ripening earlier; hence these were primed one or two days earlier.

In the process of curing, the leaves were never exposed to the direct rays of the sun, so that the whole process followed was a cool or natural one. The fermentation was done in Manila because, among other reasons, of lack of room and necessary materials in the College, the course adopted being that of aging first and fermentation later, which is said to be the method universally practised in America.

As to the effect of shade on the quality of the crop, on the whole, Cagayan and Tirona Hybrid gave the best results, the leaves produced under shade being pronounced as 'equal if not superior to Sumatra but never inferior.' Turkish Lowland, Texas Cuban and Vuelto Abajo gave only fair results. Tables are given, showing that the burning qualities of only Cagayan Sumatra, and Tirona Hybrid were improved when shaded, and that there is usually a considerable increase in the size of the leaf when grown under cheese-cloth.

There is also recorded a description of work on fertilizer-tests of tobacco carried out at the Agricultural College, to which the following conclusions and recommendations are appended: these should be of interest to tobacco growers in the West Indies:—

Conclusions. (1) Looked at from the standpoint of financial returns, the largest gains were obtained from the use of manure alone Plot (1) and legumes alone (Plot 7).

(2) From the economic stand-point of the Fillipino-farmer, green manuring, using cowpeas and other leguminous crops, and animal manuring, using horse manure and carabao-dung, furnish the cheapest material for the production of better crops of tobacco.

(3) Systematic and careful application of commercial fertilizers should be carried out by every large grower so as to determine the needs of his particular soil.

(5) All varieties used in the test showed a creditable response in height, vigour, and to some extent, in yield, to the fertilizers applied.

Recommendations. (1) More extensive and careful study in the fertilization work is needed (a) to obtain better production, (b) to determine when the quality of each of the different varieties we have at hand reaches its best, (c) and to some extent, to develop the aroma and flavour of their leaves.

(2) In using any fertilizing material, either commercial or natural, with the aim of increasing the yield of the crop in question, the land should be put in its best possible tilth.

(3) This work should be repeated in all of the important tobacco-growing districts of the Islands.

DEPARTMENT NEWS.

Information has been received to the effect that Mr.H.A Ballou M.Sc., Entomologist to this Department has arrived in Egypt. As stated in a former issue of this journal, Mr Ballou's services have been lent to the Egyptian Government for a year in connexion with insect problems of cotton production in that country.

CYCLONIC WEATHER IN THE VIRGIN ISLANDS.

In connexion with the note in this issue, page 297, on the recent hurricane in Dominica, observations received from Mr. W. C. Fishlock of the Experiment Station, Tortola Virgin Islands are of particular interest. Mr. Fishlock's observations first concern weather conditions of August 10 and 15 which indicated that a cyclone of wide area but low intensity passed to the south or south-west of Tortola on Sunday afternoon, August 13. Mr. Fishlock's second set of observations refer to the night of Monday Augnst 21 and record the passing of a storm of small area but comparatively high intensity which visited Dominica the same evening. The centre of this storm appears to have passed close to the south of Tortola. Some damage was done in that island, but more in St. Thomas, while Porto Rico appears to have suffered seriously.

CROWN LAND DEVELOPMENT IN BRITISH GUIANA.

The following information is extracted from the Report on the Lands and Mines Department of British Guiana for April to December, 1915.

CULTIVATED AREAS.

The area under cane cultivation at September 30, 1915, was 75,744 English acres and under mixed cultivation (consisting of rice 4,046, cacao and coffee 146, limes and rubber 320, rubber 46, plantains 1,339, coco-nuts 1,038 acres) was 6,935 English acres, showing an increase on the previous year of 3,587 acres in the area under canes, but a decrease of 436 acres of the area under mixed cultivation.

RUBBER PLANTATIONS.

Of rubber, 3,778 lb. were exported during the nine months as against 1,932 lb. exported during the financial year 1914-15, an increase of 1,846 lb. Of the amount exported the whole of the 3,778 lb. were cultivated rubber (*Hevea braziliensis*) from private property, the largest producer of plantation rubber being the David Young Estates, Aruka River, North Western District, now owned by the Consolidated Rubber and Balata Estates, Limited, which was responsible for 3, 653 lb., and, in addition, had on hand at the end of December 1915, 1,197 lb. of dried rubber, which was shipped during February 1916.

BALATA.

The royalty collected during the nine months under report was $23,793·37. This industry, which had suffered adversely at the commencement of the war had practically quite recovered by the beginning of April 1915, and bleeding operations were pursued during the period as hitherto. The quantity of balata exported during the nine months was 1,188,807 lb.

THE DEVELOPMENT OF RANCHING.

At December 31, 1915, there were in existence thirteen permissions for grazing cattle on the Rupununi and Takutu savannahs.

The number of cattle on these ranches was estimated in the last report at not less than 10,000 and allowing for a natural increase of only 25 per cent., the number can now safely be placed at 12,500 head of all sizes.

The raising of cattle on the coastal savannahs was successfully continued. The Abary Cattle Ranch Company Limited, whose land leased from the Crown is situate on the right bank Abary river, experienced another prosperous year, and on December 31, 1915, the actual number of cattle of all ages on this ranch was 2,010 head, and 106 head had been sold during the year, so that the forecast given in paragraph 62 (b) of last year's report on this department has been more than justified.

A few more ranches run on the same intelligent business lines of this company would mean that this colony would in a few years be in a position to engage in a cattle export trade, either of live stock or canned meat, and the by-products of the slaughtered animals.

ST. LUCIA GOVERNMENT LIME JUICE FACTORY.

RESULTS OF PAST SEASON'S OPERATIONS.

The following are the results of the crop dealt with at the St. Lucia Government Lime Juice Factory during the period May 1914 to February 1915, as reported in the recently issued Report on the Agricultural Department St. Lucia, 1915-16.

The factory opened on May 29 with prices fixed on a £24 basis, viz.: 3*s.* 9*d.* per barrel for ripe limes, and 6*d.* per gallon for raw juice testing 12 oz.

Owing to the abnormal conditions created by the war, it was impossible for some months to gauge what the effect would be on the lime juice market, and the prices paid for produce, as first payment, fluctuated from 1*s.* 8½*d.* to 4*s.* 8*d.* per barrel for limes, and for raw juice from 3½*d.* to 6*d.* per gallon.

Upon receipt of the account sales for the first few shipments of concentrated juice, it was seen that the prices had risen far above the brightest expectations.

The whole of the concentrated juice shipped from the factory between June and October sold on the record basis of £52 10*s.* per standard pipe (108 gallons, testing 64 oz. to the gallon).

The following three shipments sold on a £42, £38 and £37 basis, respectively; the remaining shipments sold at £31.

Every effort was made to improve the quality of the juice manufactured, and the average sediment was reduced to 2½ to 3 units, and in several strikes the sediment was reduced to below 1 unit.

Each strike of juice was carefully tested while boiling and again after cooling, the average test for the entire crop being 107·3 oz. citric acid per gallon in terms of free acidity.

The produce dealt with was 1,410¾ barrels of fruit, and 5,715¾ gallons of juice, which represents a total crop of 2,125½ barrels as against 326 for the year previous.

The business of the factory was conducted on a co-operative basis.

The price paid for produce was based on a scale of prices having relation to the current market value of concentrated juice, and insuring a margin of profit to the factory.

The following charges were then deducted from the proceeds: actual working expenses, 10 per cent. interest and sinking fund on capital; 6 per cent. interest on money advanced for purchase of produce, and a sum of £50 for Government supervision.

Under these conditions the vendors received a total payment of 9*s.* 11*d.* per barrel of limes, and 1*s.* $1\frac{7}{8}$*d.* per gallon of raw juice, this being 4*s.* $2\frac{1}{2}$*d.* per barrel, and $5\frac{3}{8}$*d.* per gallon in advance of the price paid to vendors the previous year.

The amount paid to the Government, as shown by the attached balance sheet, was £128 14*s.* as against £13 2*s.* 1*d.* for the year 1913-14.

Results for the crop commencing June 22, 1914, and ending February 27, 1915.

RECEIPTS.

	£	s.	d.
Net proceeds from sale of 44 casks concentrated lime juice	1,102	7	7
Net proceeds from sale of 9 carboys distilled lime oil	115	3	6
Total receipts	£1,217	11	1

EXPENDITURE.

	£	s.	d.
Paid for produce	298	18	6
Deferred payment bringing produce to rate of 4*s.* 8*d.* per barrel limes and 6*d.* per gallon of juice	174	18	6
Factory working expenses including labour, coal, oil, packages, repairs, etc.	54	18	9
Total expenses	£528	15	9

GOVERNMENT REFUND.

	£	s.	d.
Ten per cent. interest and sinking fund on capital account of £550 for ten years from April 1, 1914	55	0	0
Six per cent. on purchase of produce advances £300	18	0	0
Supervision	50	0	0
Value of lime oil on hand and paid to vendors in last crop	3	12	0
Value of concentrated juice on hand, etc.	2	2	0
Total Government refund	128	14	0
Total receipts	£1,217	11	1
Total working expenses	528	15	9
Government refund	128	14	0
Total expenditure	£ 657	9	9
Profits for distribution	£ 560	1	4

Profits now due to vendors at the rate of

5*s.* 3*d.* per barrel limes, bringing the total price to 9*s.* 11*d.* per barrel.

$7\frac{7}{8}$*d.* per gallon juice, bringing the total price to 1*s.* $1\frac{7}{8}$*d.* per gallon.

PROGRESS DURING 1915-16.

The factory opened for its third annual crop on May 29, 1915, and closed on March 11, 1916. The crop came in with a rush, and although the factory was kept working during several nights to relieve the pressure, it was not possible to handle the whole of the produce offered. This strain upon the capacity of the factory was not due so much to the increase of the peasant-grown produce as to the large quantities of juice sent in by planters, several of whom would, had it not been for the high prices of machinery created by the war, have been in possession of factories of their own.

Arrangements have been made for increasing the capacity of the factory to enable it to deal with the produce of the peasant and of the small planter whose output does not justify the immediate erection of his own works.

The produce dealt with during the year was 22,120 barrels of fruit, and 11,973 gallons of juice, which represents a total crop of 3,450 barrels, this being an increase of 1,644 barrels on the previous crop.

The number of persons having business dealings with the factory increased from 728 to 903—an increase of 175.

Juice extraction. An average juice extraction of 9 gallons per barrel of limes was obtained throughout the year; this was an increase of 1 gallon per barrel on the previous year's working. The juice was, however, of a slightly lower acidity, averaging 12·2 oz. per gallon.

Distilling. The still, which is constructed of wallaba staves and greenheart bottom, has given entire satisfaction throughout all three crops, and small stills of such construction can, therefore, be confidently recommended.

Whether a wooden still of double the capacity will answer equally well is a matter of some importance, now that the market price of copper is almost prohibitive. A wooden still of 300 gallons capacity has been ordered to replace the small one now in use, so that in the near future the question of wooden *versus* copper stills will be decided.

The yield of essential oil obtained was equal to 6·6oz. per barrel of limes or ·73 oz. per gallon of juice.

Concentrating. The average degree of concentration was approximately 9 to 1, and the average test of prepared juice was 108 oz. citric acid per gallon. The quality of the juice was slightly improved upon, and the average sediment was 2·5 units.

PRICES OBTAINED FOR FACTORY JUICE.

The price obtained for concentrated lime juice has been exceedingly satisfactory. Every shipment of juice from the factory has realized a much higher price than the London market quotations at the time of sale. The average difference between the two rates for the year 1914 was £10 2*s.* 6*d.* per standard pipe (108 gallons testing 64 oz.) in favour of the factory juice, and the maximum difference was reached in November, when an advance of £22 10*s.* over market quotations obtained.

During 1915, the prices, relatively speaking were not so high as in the previous year; nevertheless a satisfactory difference in favour of the factory juice was maintained throughout.

The average gain throughout the year was £10 1*s.* 8*d.* per standard pipe, and the maximum difference £16, being obtained in March, and the minimum, £6, in August.

NEW DEVELOPMENTS.

During the period under review an Advisory Committee was appointed by the Administrator of the Colony, on which the general public are represented. During the year also, arrangements were made for extending the factory. This will have the effect of relieving the pressure that was felt during the past season.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of agricultural colleges for the tropics.

On page 292 will be found an account of the working of the Antigua Government Granary during 1915, while on page 294 will be found the results of last season's work at the St. Lucia Government Lime Juice Factory.

Insect Notes in this issue consist of information concerning the control of a wood-boring larva. Fungus Notes, on page 302, deal with a new fungus on the green scale.

A review of a useful pamphlet on plant propagation will be found on page 302.

Agricultural Credit Societies in Ceylon

According to the *Tropical Agriculturist*, there are now fifty-five registered societies in Ceylon with a membership of 4,800 and a paid-up capital of a little over Rs. 25,000. The main object of these societies is to help the villager by lending him money at a low rate of interest to carry on efficiently his agricultural pursuits. Much good has also been done by local societies purchasing and retailing manure to members on easy terms. During 1915 and the first quarter of 1916, about 81 tons of manure purchased at a cost of about Rs. 8,450, have been distributed among the members of twelve societies. The bulk of the manure was for paddy land.

Several of the societies are interested in the improvement of paddy cultivation, and with the assistance of the Agricultural Society are making trials with new strains of seed, in transplanting, etc. The starting of gardens has been proposed by more than one society and it is hoped that these will be established before long. In India the question of amalgamating the departments controlling Co-operative Credit Societies with the Agricultural Departments has been under consideration. In Ceylon the Government anticipated this idea by appointing the Director of Agriculture as the head of the Co-operative Credit movement.

Owing to local and foreign disturbances the movement has not progressed as much as it should have done during the past year.

It is hoped that the members of this Board will do everything in their power to increase the number of Co-operative Credit Societies, and thus help those who are in great need of assistance.

Scientific Research and Industrial Progress.

Though not directly bearing upon agriculture the address delivered at Colombia University by Dr. C. E. K. Mees, and reproduced in *Nature* (July 13, 1916) is of general importance in that it shows the necessity for scientific research where it is desired to maintain the leadership in any line of industrial work.

Referring to the modern industrial research laboratory of the United States, it is pointed out that the triumphs which have already been won by these laboratories are common knowledge. 'The incandescent lamp industry, for instance, originated in the United States with the carbon lamp, but was nearly lost to the United States when the tungsten filament was developed, only to be rescued from that danger by the research laboratory of the General Electric Company who fought for the prize in sight and developed first, the drawn wire filament, and then the nitrogen lamp; and we may be sure that if the theoretical and practical work of the research laboratory of the General Electric Company were not kept up the American manufacturers could by no means rest secure in their industry, as undoubtedly, later developments in electric lighting will come, and the industry might be transferred, in part, if not completely, to the originators of any improvement. Manufacturing concerns, and especially the powerful well organized companies who are the leaders of industry in this

country, can, of course, retain their leadership for a number of years against more progressive, but smaller and less completely organized competitors, but eventually they can ensure their position only by having in their employ men who are competent to keep in touch with, and themselves to advance, the subject,—and then maintenance of a laboratory staffed by such men is a final insurance against eventual loss of its industry by any concern.'

The Mangoes of Cuba.

A paper read before the American Pomological Society by Mr. Wilson Popenoe in September 1915 contains rather interesting information concerning the types and distribution of mangoes in Cuba. As Cuba was known to possess a large number of interesting races and types, it was thought worth while to devote the month of July 1915—the season during which most of the mangoes ripen—to a thorough investigation of Cuban mangoes, in order to learn as much as possible concerning their relationship, productiveness and other characteristics, and to bring to light choice types which might be worthy of propagation.

The common seedling races, mango and manga, are pretty well distributed throughout the island. There are a few places, however, which possess unusually choice types and are noted for them throughout the island. Chief among such places are Cienfuegos and Santiago de Cuba With the exception of the Filipino, which is found around Habana and which he has never seen in eastern Cuba, the writer says the best mangoes of the island are probably grown near these two cities.

Dealing with the different races and types the mango race is said to be by far the commonest throughout Cuba. It seems, in fact, to be the common race in other parts of tropical America as well. The next race taking them in the order considered, is the 'manga' This race includes two distinct and widely distributed types in Cuba: 'Manga amarilla' is the commonest form, and seems to be a general favourite. The fruits of the 'Filipino' are said to be of unusually good quality, and it is unfortunate that the trees should be unproductive. 'Biscochuelo' is a very distinct type and undoubtedly the best grown at Santiago de Cuba: considered from every point of view, it would seem to be, in fact, the most desirable type in the island of Cuba.

The need of a natural system of classification is emphasized, as opposed to an artificial or arbitrary one, in which mangoes are grouped according to the shape of the fruit, or some other character of this nature. Such a system, it is said, while perhaps useful, does not really meet our needs, and should be avoided. A system taking into consideration natural affinities of varieties or types, cannot, it is claimed, fail to be of great value in our study of the mango. Such a classification would comprise three divisions; the first and broadest one is *races*; the second seedling *types*, several of which may be included in one race; and the third horticultural *varieties*, which are propagated by budding or grafting, and of which several may be included in one type.

Storm Damage in Dominica.

Mr. Joseph Jones, Agricultural Superintendent and Curator of the Botanic Gardens Dominica, has furnished this Office with particulars regarding the hurricane that passed over that island on Monday August 28. According to this report, from 6.30 to 7 p.m. several heavy gusts of wind passed over Roseau from the north-east. These did a considerable amount of damage. The centre of the storm that is, the calm period, lasted for twenty-five minutes, from 7 till 7.35 p.m., after which the wind blew furiously from the south-west. By 10 p.m. the storm was practically over. During the storm period the barometer fell to 29·10.

Mr. Jones states that plantations in the Layou valley, Imperial Road and to windward appeared to have suffered most, and those in the northern and southern districts less so. In many cases the crop which promised to be a record one is believed to be practically lost. It is fortunate that during the three weeks before the storm, pickings of fruit on all estates were very heavy, but a large part of the ripening crop and the second crop which was on the trees has disappeared.

The rainfall in Roseau during the night was 4·90 inches. In the country districts the fall was much heavier. Considerable damage was done to cultivations and roads, and several bridges were washed away by the overflow of rivers.

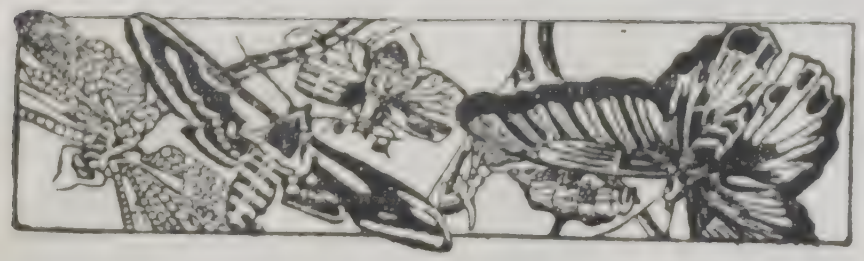
The death roll as far as is known to date is fifty-seven. Among the killed are Mr. and Mrs. William Davis of Concord Estate. Mr. Davis was a well known Dominica planter.

Mr. Jones states that the Botanic Gardens has suffered much more than in the hurricane of 1915. Although fewer trees are down, the general injury is much greater. Very few trees have escaped damage completely and many are reduced to mere stumps.

The most serious effect of the storm from the point of view of the Agricultural Department lies in the fact that the cacao and lime experiment plots have suffered considerably. On three of the lime plots the fine well matured trees are all down, and only about half-a-dozen will survive. It will be remembered that continuous manurial experiments are being conducted on these plots and this storm damage constitutes a very serious disturbing factor in regard to obtaining satisfactory results.

Mr. Jones in his report adds a few remarks in regard to the repair of the damage done particularly in relation to lime cultivation. Where the lime trees are blown over but still retain a firm root-hole of the ground, a rapid renewal by means of suckers is possible, while the old portion of the trees, will under careful handling keep on producing fruit. In places where the lime trees are torn up out of the soil by the wind, or washed away by the flooded rivers, new plantings will be necessary.

Much sympathy is to be felt for Dominica in its present adversity, but there is little doubt that with vigorous local action the set-back will be only temporary.



INSECT NOTES.

THE CONTROL OF A WOOD-BORING LARVA.

In view of the occurrence of the wood-boring moth *Duomitus punctifer*, Hamp. in the West Indian islands, and the damage done by it to a wide range of shade and fruit trees (see *Agricultural News*, Vol. XIII, p. 328) the following details as to the methods of control available should be useful. They are taken from an account of a closely related species of similar habits given by L. O. Howard and F. H. Chittenden in *Farmers' Bulletin* No. 708, of the United States Department of Agriculture:—

'The protected and concealed manner of life of this borer, as shown by the life-history, which will apply in the main to borers in general, renders it very difficult of treatment by means of insecticides or other direct manures. The most efficacious remedial measure consists in cutting off and destroying affected branches, and in the injection of bisulphid of carbon into the holes or burrows where the larvae are at work.

'Twigs or branches which, by their wilting or by the presence of burrows showing accumulations of frass or sawdust-like castings at their entrances, indicate the presence of this borer, should be carefully searched out, the smaller ones pruned away and the larger ones cut back, and the amputated portions promptly burned. The stubs should be coated, preferably with grafting wax, to prevent the entrance of other insects or the spores of decay-producing fungi, although coal-tar preparations containing mineral substances are in somewhat general use for this purpose. After windstorms the affected branches which have fallen to the ground and those which remain attached to the tree should be collected and burned. Wherever trees show that they are past recovery it is best to take them out and promptly destroy them. The word "promptly" is used advisedly, since this insect, as previously stated, frequently migrates from one twig or branch to another.

'In the case of young and rare trees and others which show only a few larval burrows in the bark, bisulphid of carbon is the best remedy and one which has been in general use against the present species in the public parks of New York City. It is injected into the openings of the burrows, and the openings are immediately afterwards closed with various substances. For this injection a mechanic's long-spouted oil can of small size may be used on large trees, but against a related species the writers have made very good use of a small glass syringe, such as may be purchased at drug stores for about 10 cents. These glass syringes are most serviceable, because the exact amount bisulphid may be seen when drawn into the syringe, and because there is no threading to be injured by the reagent. Metal syringes may also be used, but it is more difficult to measure the exact amount, and the bisulphid acts on the leather packing. Rubber syringes are not serviceable because of rapid corrosion. About a teaspoonful of the liquid bisulphid is sufficient for each borrow.

'For stopping the holes after injecting the liquid, putty and moist clay, advised by some, have been found practically useless. Grafting wax, on the other hand, gives perfect satisfaction. Coal-tar is less advisable but may be substituted for the latter, or the holes may be closed by inserting a wooden plug and breaking or sawing it off even with the trunk. In any case the stopper should be tight, to exclude water from rains, which might tend to produce decomposition of the surrounding wood or invite the entrance of other insects, like carpenter and other ants and secondary borers, of which there are many species, and injurious fungi.

'It is possible to reach and destroy many larvae by forcing a copper or other pliable wire into the channels. This is a well-known borer remedy. It is impossible, however, by this means to kill the insects in all cases, owing to the length or crookedness of the burrows. Bisulphid of carbon should then be used.

'To what extent electric or other bright lights are serviceable as an agency in the destruction of the moths of this borer has not been definitely determined, but they possess a certain value. A method frequently advised consists in placing shallow pans around electric-light poles in and about parks to attract the moths. The pans are partially filled with water, and a small quantity of kerosene is poured into them. The moths flying against the globes drop into the pans and are promptly killed when they come in contact with the oil. In this way many males can be destroyed.

'In large parks the destruction wrought by this borer annually is an important item, and it will be found profitable to establish a system of inspection consisting in the employment of park keepers and boys and others who may be engaged at lower wages to keep a constant lookout for evidences of borer attack on valuable trees. In 1893 a New York entomologist spent two months in fighting this insect alone in the city parks of New York, collecting wagon loads of limbs and branches and destroying the contained larvae and pupae.

'If valuable trees are to be protected, the insect should not be allowed to breed in useless growth. The borers in such trees should be destroyed or the trees promptly felled and burned. Care should be exercised in transplanting trees and fertilizers should be used in order that the trees may be always thrifty, the better to withstand attack. This also means protection from the attack of aphides, scales and defoliators such as the white-marked tussock moth and the fall webworm, and keeping them free from disease.

'Finally, in the control of this species promptness and thoroughness cannot be too strongly emphasized. The bisulphid of carbon remedy should always be used where applicable, and the inspection system advised should be instituted in all public parks and on city streets infested by this pest. Individual owners of valuable trees should become acquainted with the pernicious nature of this borer, and united action should be secured with neighbours whose trees suffer from the ravages of the pest.'

PROGRESS OF AGRICULTURE IN INDIA.

Though somewhat belated, the report on the progress of agriculture in India for 1914-15, issued by the Agricultural Adviser to the Government of India, contains a large amount of valuable information and shows the extent to which both the Imperial and Provincial Agricultural Departments in India have extended their activities during recent years. This report is further of interest in the West Indies in that the general nature of the organization of the Agricultural Departments in these islands is parallel to that in India, though, of course, the West Indian organizations are relatively small. Nevertheless, in both the West Indies and India similar agricultural problems have to be faced : they only differ in degree.

As regards the results obtained at the Agricultural Research Institute, Pusa, reference is made first to the field experiments dealing with the maintenance of soil fertility under double cropping. In regard to chemistry, the conclusion of the work on soil temperatures is referred to, as is also the work on the 'clamping' of sugar-cane. In regard to botany, work with wheat has been continued, while the results of the indigo experiments so far undertaken seem to point to the fact that the problem of wilt is solved. Important work has been accomplished in regard to fibres. After referring to the mycological and entomological work, reference is made to the studies conducted in agricultural bacteriology, which has concerned bacterio-toxins in soils. The inhibition of nitrification in water-logged soils was found to be due rather to the action of toxins resulting from certain classes of bacteria which thrive under these conditions than to lack of oxygen merely. It was found that germination in a water-logged soil was interfered with owing to the rapid reduction of nitrate which takes place under such conditions, and it seems probable that the toxins produced under these conditions would not only affect the germination and growth of seedlings, but also alter the character of the soil complex so as to promote reduction of nitrates to nitrites for just so long as this abnormal character persisted.

Turning to progress in the Provinces, it is learnt that in Bombay, besides progress in the work on some of the special crops like cotton, sugar-cane and fruits, considerable advance has been made in effecting improvements in general farming matters, as for instance, the more extended use of the iron plough.

In Madras, the most notable events of the year were the admission of twice the usual number of students to the agricultural college as a result of the institution of the new courses, and the holding of an agricultural and trade conference in Madras. The activities of the Department during the year were mainly directed towards the selection and distribution of seed of the best varieties of crops, more especially rice and cotton, the two most important crops of the Presidency.

In the Central Provinces, the Department has continued to make great progress in the development of co-operative organization referred to in previous reports not only for demonstrating improved methods, but also for the production and distribution of a large quantity of seed.

In Bengal, the work of the Department suffered most owing to paucity of expert staff. Useful work is, however, being done on rice and sugar-cane and date palms. Among the crops of the United Provinces, wheat, cotton, and sugar-cane continue to receive most attention during the year. Reference is made to an effort to produce a variety sf sugar-cane possessing qualities fitting it for general cultivation in different parts of the Provinces.

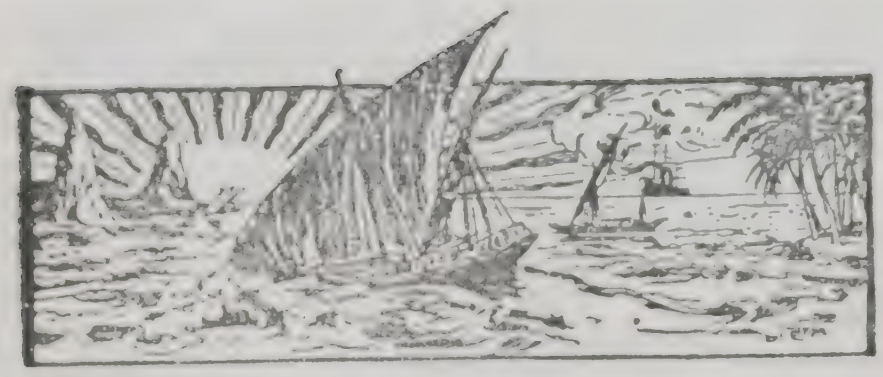
In Punjab, the activities of the Department were mainly concerned with the demonstration and sale of improved implements, and with the spread of improved wheat and cotton seed.

The remaining and greater portion of the report deals with progress made in the study of crops and special subjects. The detailed information will prove useful for reference but scarcely needs further attention in this article.

It may be pointed out in conclusion, that much of the most valuable work accomplished in India is the result of investigaton in economic botany as exemplified by the production of Indian wheats and fruit. The need for extending economic botanical research in the West Indies is clearly indicated; if this were effected, it would soon lead to valuable results Scarcely a single crop in the West Indies has been specifically investigated from a general botanical standpoint.

Tobacco Fertilizer from Indigo Plant.—The residue of the indigo plant, after the extraction of the indican, known commercially as indigo, is used in the Karachi district, and probably also in other parts of India, as a fertilizer for the tobacco, says the United States Consul at Karachi in a recent report. This substance is known locally as 'seeth.' The roots of the tobacco plant require free access to air, and seeth breaks up the ground in a way which allows the air to penetrate. Experiments have been made recently by the Agricultural Research Institute at Pusa with the object of securing better results from the use of seeth. The substance his been used for years by the natives, but little scientific work has been done in India until the last ten years. The experiments so far indicate that tobacco soil in which seeth and bits of broken tile or broken chatties (baked clay water-jars) are mixed, produces better crops than soil under no special treatment. The cost is moderate, and the results achieved warrant the extra expense. A plot of tobacco land near Pusa was treated in this way nine years ago, and has shown marked superiority over adjoining plots ever since. Indigo, adds the Consul, has had a remarkable 'boom' since the war began, and the amount of seeth available as fertilizer has increased accordingly. (*Journal of the Royal Society of Arts.*)

Grenada Prize Holdings Competition.—The Reports of the Judges on the 1915 Cacao Prize Holdings Competition held in various parishes have been received, and the following features of interest are herewith extracted In the parish of St. George's the results of the competition do not appear to have been very satisfactory; there were fewer entries, and the work shown was not equal to last year's standard. A similar report has been made by the Judges in St. John's and St. Mark's. In St. Patrick, the work on the whole was good, with the exception of drainage, which was very faulty. The forking and bedding was found to be good, and most peasants used pen manure. The sum devoted to prizes in each parish amounted to about £25. This year the Grenada Prize Holdings Competition is being pushed more actively by the officers of the Agricultural Department: this has been facilitated through the appointment of a second Agricultural Instructor.



GLEANINGS.

According to a note in the *Experiment Station Record* Vol. XXXIV No. 9, the partial substitution of cassava flour in the ordinary grain rations for dairy cattle in Madagascar resulted in an increased milk and milk fat yield and in a greater live weight of the animals so fed.

According to a note in the *Queensland Agricultural Journal* for June 1916, the lime fruit is not widely appreciated in Australia. The Journal, however, reproduces certain information emanating from the Imperial Department of Agriculture for the West Indies, apparently with the idea of popularizing the fruit as much as possible.

We regret to have to call our readers' attention to an error in calculation which appeared in the editorial in the last issue of the *Agricultural News*. On page 274, second column, four lines from bottom, 224 should read 448. This also affects the argument which follows, based on the erroneous figure.

The influences of lime on corn is dealt with in *Soil Science* (Vol. I, No. 5) Under the conditions of the New Jersey Agricultural Experiment Station, the application of ground limestone at the rate of 2 tons per acre, increased the yield of shelled corn by about 10 bushels, and of stover by 432 lb. per acre, as compared with the yield from a similar series of unlimed plots.

According to German investigations summarized in the *International Review of the Science and Practice of Agriculture* (February 1916) the first litter of a young sow generally contains more males than females, whilst in the later litters there are more females Generally after the fifth litter the females predominate. In 135 litters the number of young was greater than 10: in 181 litters it was less than 10.

A considerable number of interesting economic and decorative plants were introduced into St. Lucia during 1915-16. Amongst these were the marking nut (*Semecarpus anacardium*), the juice of which is mixed with quicklime and then used for marking linen. A small tree known as Bilimbi (*Averrhoa Bilimbi*), bearing acid fruits 3 inches long was also introduced: it is used in pickles and preserves, and makes excellent jams.

The addition of certain salts like sodium chloride and sodium sulphate to certain Californian soils was observed to produce an impervious condition. An investigation, described in the University of California Publications in Agricultural Sciences, showed that the condition seems to be closely associated with the direct addition or absorption of sodium, thereby producing in the soil a new silicate complex of a colloidal character

The Report of the Agricultural Department and Experiment Station for the Virgin Islands for 1915 is referred to in a note in *Nature* for June 1, 1916, and special reference is made to Onion Growers' Associations in the Leeward Islands. The note concludes: 'from the reports of the various islands, it is clear that the Imperial Department of Agriculture is making every effort to extend the scope and foster the progress of agriculture in the West Indies.'

According to the report on the Agricultural Department of St. Lucia 1915-16, Pencil Cedar (*Juniperus barbadensis*) has done remarkably well in the Colony. The whole of the ninety-five plants made good progress during the year and may now be regarded as established. The plants are well branched, and of an average height of 3 feet. *J. bermudiana* does not appear to be quite as robust under the same conditions as the former species. *J. pachyphloea*, with its silvery appearance, is by far the most ornamental of the three species, but unfortunately it is the most delicate.

According to the Durban *Agricultural News*, an excellent manure is produced by mixing filter-press cake with one-third of fish manure. This is done on the north-coast of Natal. The land is ploughed, harrowed, and then generally the filter-press cake applied alone. The land is left untouched for about four months, at the end of which time the fertilizer is ploughed in and about one-third of the quantity of fish manure is placed on the ground, after which planting is commenced. On this basis it is estimated that the filter-press cake is worth about 10*s.* a ton, whereas formerly it was worthless.

A formula has been devised for determining the daily ploughing capacity of tractor ploughs based on the results of different ploughing tests, and having special referrence to the relation between break and drawbar horse power, depth of ploughing, actual hours of work, etc. Detailed information will be found in the *Experiment Station Record* Vol. XXXIV, No. 9, p. 891. This formula should prove useful in comparing tests made in different countries; but it is important that those who conduct the tests furnish in their reports the requisite data in order that the formula may be generally employed.

The cultivation of drug plants receives attention in the *Agricultural Gazette of New South Wales* for May 2, 1916, and reference is made to the shortage of atropine derived from several plants of which the chief temperate country ones are the Deadly Nightshade (*Atropa Belladona*) and Henbane (*Hyoscyamus niger*). It will be remembered that in the last issue of this Journal, attention was called to a recent importation by the Imperial Department of seed of *Hyoscyamus muticus*, the Egyptian and Indian Henbane, which is reported to yield a higher percentage of drug than the temperate country plants.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. According to the Agricultural Superintendent's report, work in the Experiment Station and Botanic Gardens during the month of July involved chiefly planting and cultural operations. The following plants were distributed: selected corn 95lb., coco-nuts 59, papaw seed 3oz. Concerning staple crops, Mr. Sands says the weather was seasonable and crops were making good progress in St. Vincent. In the Grenadines, on the other hand, the weather was dry and crops were suffering. On the 25th an Ordinance termed the Cotton Stainer Ordinance was passed by the Legislative Council and assented to by His Honour the Administrator on the same day. A credit system of supplying small growers with cotton seed for planting was inaugurated at the Government cotton ginnery. The Agricultural Superintendent visited the Windward District from July 14 to 17. During this visit an inspection of canes at Colonarie estate was made. Moth borer and mealy-bug were present in and on canes in places, but the damage being done was not severe. The mealy-bug was being extensively attacked by the entomogenous fungus, *Aspergillus flavus*. In the Georgetown district the distribution of the cotton stainer and its effect on early planted cotton was studied. The Ordinance referred to above was passed with the object of empowering the Agricultural Department to take the steps deemed necessary to control the cotton stainer pest, and Mr. Sands states that operations consisting in the destruction of 'John Bull' trees and the collection of the stainers found thereon were commenced on the 26th, in several districts.

ST. LUCIA. Mr. A. J. Brooks writes to say that during the month of July the following plants were distributed: limes 9,100, decorative and ornamental 38, cassava cuttings 500, vegetable seeds 99 packets, budded oranges and grape fruit 71. Work in the Botanic Gardens included the erection of a new entrance gate on the western boundary, for use of pedestrians only. As regards staple crops, cacao is said to promise well, the lime crop is coming in fast, and sugar-canes are making good growth. Extension in lime cultivation continues. The Imperial Commissioner addressed a meeting of the Agricultural and Commercial Society on July 10, on which date he returned to Barbados after a stay of twelve days in the island. During his stay Dr. Watts, accompanied by the Agricultural Superintendent, visited Laborie, Vieux Fort, Micoud Dennery and Castries. The peasant-grown produce presente,d at the Government Lime Juice Factory has increased for the time being, says Mr. Brooks, to the total exclusion of produce from the large estates.

HOME PROJECTS IN AGRICULTURAL EDUCATION.

It is the aim of Bulletin No. 346, issued by the States Relations Service of the United States Department of Agriculture, to give suggestions towards making the home farm or estate a more definite factor for agricultural students in instruction through what is known as the Home Project Plan.

In recent years progressive teachers of science have made an effort to break away from text-books and formal laboratory work, and adapt their teaching to the environment of their students. Students have been assigned special problems at home which would involve the principles studied. These problems were called Projects. When electricity was studied in a certain school one student was given the wiring of his father's house as a project in which he could apply the principles learned. Another student made a study of the germination of seeds and other problems involved in his home garden in connexion with a study of plant growth A general extension of this idea in relation to practical agriculture is what the Bulletin advocates. It continues by pointing out that a distinction should be drawn between a Project and a simple exercise used as a Practicum to illustrate some principle, or for the purpose of increasing skill in some operation of farm or shop A Project, to be worthy of the name, should involve skill in many operations and the application of a number of principles. To accomplish this it should cover a branch of farming that will extend over a comparatively long period of time. The testing of seed corn may be cited as an example of the simple laboratory exercise performed at school. The stringing of seed corn would be a suitable home practicum, the aim of which would be to enquire skill in the useful operation. The growing of an acre of corn would involve both of these operations and many others, hence it would be a worthy project.

At the end of the Bulletin are given outlines of project studies. As an example, reference may be made to the Pig Project Study outline. The student is supposed in pursuing these projects to ask himself a number of questions. In the case referred to the questions run thus: Shall I raise pigs for my project? And as subsidiary questions—Do I like pigs? Is this section suited to the profitable production of pork? Do pigs fit in well with the farm management plan? Is cholera or any other disease likely to prevent profits? Other leading questions are: What shall be my aim in raising pigs? How shall I get a start? Can I give breeding animals proper management? How shall I care for young pigs? How shall I fatten my pigs for market? and so on.

It will be obvious that the object of these courses of study is to enable the student to combine business experience with his academic studies in order that he may eventually become trained to take up practical farming without the usual period of apprenticeship which has formerly been found necessary. It is of interest to record the fact that in the West Indies, the Cadet System instituted by the Imperial Department of Agriculture, whereby the student while continuing his scientific studies at the local secondary school, spends the larger portion of his time at the Botanic Station doing agricultural work, is somewhat parallel to the American idea of Home Projects. It is possible that in the West Indies, arrangements might be made for students whose parents are connected with estates to take up such home projects as growing an acre of corn or cotton, or keeping pigs, etc., as suggested in this Bulletin.

A somewhat remarkable note appears in the *Wealth of India* condemning in wholesale fashion the Anderson Oil Expeller in the Indian oil pressing industry. It is stated that this equipment has been imported into India on the advice of Government experts, but in no case has this machinery been found to give satisfaction. These unfavourable reports are reproduced in the *Wealth of India* from apparently a native publication, and it would seem, considering the successful work of the Anderson Oil Expeller in the United States and locally in the West Indies, that the statements regarding its inefficiency in India are exaggerated if not unfounded.

FUNGUS NOTES.

A NEW FUNGUS ON THE GREEN SCALE.

A fungus hitherto unrecorded and as yet undescribed has heen found on examples of the green scale, *Coccus viridis* (*Lecanium viride*) infesting lime twigs forwarded from Montserrat to this Office for examination. Two lots of material have been received from the Curator: the first collected by Mr. Morland at Olveston, the second by Mr. Robson himself.

The fungus is not externally visible, but the insects are seen dead and discoloured at all stages of growth. Under the microscope the fungus is seen to be developed almost entirely within the body wall of the insect, the most characteristic feature being the presence of large numbers of pearshaped conidia. These renew themselves by putting out a long and very slender tube, at the end of which an expansion is formed which receives the contents of the original conidium. The tube is typically straight for the first part of its course, with a double bend, approaching to an S near the extremity. The secondary conidium is of the same form as the first. Some of the conidia have been seen to have doubled their length by the development of a blunt-ended cylindrical protrusion of quite definite form. At one stage abundant closely-set simple or bifurcated conidiophores bearing terminal spherical conidia have been seen arising within the body of the insect from a mat of hyphae.

Specimens and sketches of the fungus have been submitted to Professor R. Thaxter, of Harvard University, who has kindly replied to the effect that the fungus is of great interest, and undoubtedly a primary parasite, more nearly related to *Empusa Fresenii*, Nowak. (Entomophthorae) than to any described form. The same form was received by him from Cuba a number of years ago but was not described, and it does not seem to have been mentioned by any writer. Professor Thaxter suggests an attempt to cultivate the fungus on artificial media with a view to its use in scale insect control.

Empusa Fresenii, the fungus above referred to, is reported by Thaxter to occur on Hemiptera and aphides in the United States and in Europe, and by Johnston on certain mealy-bugs in Porto Rico. (J. R. Johnston, *Bull. 10, Bd. of Comm. of Agr.*, P.R.) The last mentioned hosts are found dead, blackened, covered with a whitish coating, and easily crumbling to pieces. A closely related species *Entomophthora pseudococci*, Speare, is described as having considerable economic importance as a parasite of the pink mealy-bug of sugar-cane (*Pseudococcus calceolariae*) in Hawaii. (A. T. Speare, *Bull. 12, Hawaiian Sugar Planters' Association.*) Infested insects are recognizable by their chalky white appearance and the brittleness of the body wall. This fungus has been successfully grown in artificial cultures.

With regard to green scale itself, it is of interest to note that Dr. Coleman, Director of Agriculture, Mysore, addressing the United Planters' Association of Southern India (*Proc. U.P.A.*, 1915) discussed the usefulness of a fungus of the same nature as the one under consideration, which occurs on that insect in the Indian coffee plantations. He reported that in comparison with the familiar white fringe fungus (*Cephalosporium lecanii*) on the same host, the fungus referred to appeared to be more capable of development and spread in comparatively dry seasons.

It will be interesting to learn what part the fungus found in Monsterrat plays in the control of green scale. Seeing that it is also reported from Cuba it seems probable that like other scale-destroying fungi it will be found to be general in its distribution in these islands. Its inconspicuous method of growth would sufficiently account for its having previously escaped attention. Where numbers of the immature insect are found brown and dead, its presence may be suspected and a microscope used for its detection.

W.N.

PLANT PROPAGATION INSTRUCTION.

A copy has been received of a valuable hand-book, by Mr. P. J. Wester, Horticulturist in charge of the Lamao Experiment Station in the Philippines, issued by the Director of Agriculture as Bulletin No. 32 of the Bureau of Agriculture. This publication will be found of much interest and use by agricultural officers and planters in the West Indies, especially as the latter are now turning their attention more and more to raising their own planting material. The Bulletin deals with plant propagation in all its practical aspects. The contents consist almost entirely of practical instructions so that a summary of the information is almost impossible; a brief survey of the chief subjects dealt with, however, may serve a useful purpose.

These include an account of plant and propagation sheds, nursery accessories, the propagation from seed and the rearing of stock plants, propagation by budding, propagation by layering and marcottage, propagation by graftage, brief directions for the vegetative propagation of tropical and semi-tropical fruits, brief directions for tree planting and orchard management, an account of shade trees and ornamental plants diseases and insect pests, spraying and formulas for fungicides and insecticides, lists of tropical fruits in the Philippines, tables showing distances for planting, tables showing the number of plants, set at given distances, required for one hectare, and lastly, tables of weights and measures.

In dealing with the principles of plant propagation it is stated that 'Plants perpetuate and reproduce themselves by means of two methods: (a) sexually, or from seeds or spores, which is the method most commonly employed by plants in their wild state, and (b) asexually or vegetatively, when reproduction is effected without the aid of generative organs of the plants, or by the propagation of a growing or vegetative part, such as (1) by means of runners above the ground, as for instance the strawberry; (2) by underground runners, commonly called ratoons, as in several species of grasses, the pine-apple, etc : (3) by tubers, bulbs, or rootstocks, as for instance the yautia or gabe, and the banana: (4) by stolons, such as certain grasses, *Chlorophylum elatum*, etc.: (5) by aerial bulblets, produced in the axils of the leaves, as in the several species of Dioscorea, or as in the sisal hemp plant in the flower stalks in the pine-apple the bulblets grow out among the leaf scales immediately under the fruit, when they are commonly called slips; (6) by roots like the sweet potato: (7) by the

formation of germinative tissue, such as in certain tubes of the genus Dioscorea or in the leaves of the Begonia. These are natural means of propagation.

In the section giving brief directions for the vegetative propagation of tropical and semi-tropical plants, the following notes are extracted as being of interest and instructive:—

Avocado, *Persea americana.* Use tender to mature, but green smooth, petioled budwood; cut the buds 3·5 to 4·5 centimetres long; age of stock at point of insertion of bud unimportant.

Cacao, *Theobroma cacao.* Use non-petioled, matured, brownish or grayish budwood that has been of slow formation, of current or last year's growth; cut the buds 4 to 5 centimetres long; insert in stock at a point approximately the same age and appearance as the scion.

Camia, *Averrhoa Carambola.* Use non-petioled, fairly mature brownish or grayish, still-downy budwood; cut the buds 3·5 to 4·5 centimetres long; age of stock at point of insertion of bud unimportant.

Cashew, *Anacardium occidentale.* Use non-petioled mature budwood which is turning grayish; cut the bud 4 to 4·5 centimetres long; insert the bud in stock at a point of approximately the same age and appearance as the scion.

Coffee, *Coffea* spp. Propagated by cleft grafting in Java. The scions are made from upright growths, not the branches, in order to produce trees of normal growth, well-matured, green and smooth 5 to 7·5 centimetres long and inserted in the stock where it is already brownish and rough 15 to 25 centimetres above the ground; tied with unwaxed tape and narrow glass tubes placed over the grafted plant to prevent entrance of rain-water into graft. Excelsa, Liberian and Abeocuta coffee are considered the best stocks.

Experiments under way at Lamao Experiment Station indicate that shield budding will be successful if mature, green, smooth non-petioled buds are used, and are entirely covered with waxed tape.

Lime, *Citrus limetta.* See Orange. Congenial stocks are sour orange, orange, rough lemon, pomelo, calamondin.

Mango, *Mangifera indica.* Use non-petioled, mature smooth green budwood from the first, second or third flush; cut the buds 4 to 4·5 centimetres long with ample woodshield; insert the buds in stock at a point approximately of the same age and appearance as the scion.

Orange, *Citrus aurantium.* Use fairly to well-matured petioled, green and smooth perfectly spineless and round budwood; cut the buds 2·5 to 4 centimetres long; age of stock at point of insertion of bud unimportant. Congenial stocks are: sour orange, rough lemon, pomelo, lime, calamondin.

Papaya, *Carica Papaya.* Propagated by cleft grafting and side grafting. Make grafts preferably not more than 10 centimetres aboveground, in stocks preferably 20 to 30, not more than 50 centimetres high, or more than 2·5 centimetres in diameter at point of union; in the cleft graft, if there is any considerable hollow in stock, make the cleft to one side of it; in the side graft make the incision entirely outside of the hollow; make scions from sprouts about 7 centimetres long of old papayas; trim off nearly all leaf blades, leaving the petioles. Perform work late in the afternoon and keep plants shaded.

Tamarind, *Tamarindus indica.* Use petioled, well-matured brownish or grayish budwood, cut the buds 3 centimetres long; age of stock at point of insertion of bud unimportant.

GRADING BY LAW IN THE PHILIPPINES.

For more than ten years according to the *Philippine Agricultural Review* (Vol. IX, No. 1, 1916) there has been an increasing amount of dissatisfaction on the part of manufactures both in the United States and Great Britian with abuca fibre or Manila hemp. This was largely due to there being no uniform system of grading the fibre in existence.

With a view to remedying the situation, an Act was passed providing for a Government system of inspection, grading and baling.

The defects in the methods employed prior to the enactment and enforcement of the fibre-grading law, were directly traceable to the following causes: (1) the lack of fixed and accepted standard grades; (2) the inadequacy of the prevailing methods of grading the fibre and of designating the grades; (3) the lack of any authoritative control over the operation of the grading establishments, and (4) the more or less general ignorance of the producers as to the quality of their product.

To remedy the above state of affairs, the fibre-grading law and the regulations authorized by it embody the following provisions: (1) the establishment of fixed standard grades for each of the chief commercial fibres exported from the Philippine Islands; (2) the requirement that every grading establishment shall grade and prepare fibre for export in accordance with the established standard and with the regulations; (3) the institution of a system of inspection of all graded fibre, and supervision over all grading and baling operations to enforce compliance with the regulations; and (4) the institution of an educational campaign among the producers for the purpose of improving the methods of production and preliminary preparation of the fibre.

The provisions of the fibre-grading law and the subsequent regulations authorized by it were adequately enforced during the past year. Standards of quality were designated and defined, and every bale exported from the Philippine Islands since the date on which the law and regulations went into effect, bears the name of the grade of the fibre contained therein, the name of the grader, the name of the district or province where the fibre was produced, and other marks and data of indentification.

In dealing with the cattle supply of the world the opinion is expressed in the *Geographical Journal* for July 1916. that among the countries likely to come to the fore in the future, Brazil is probably to be placed in the front rank of all, the plateaus of the southern interior offering exceptional advantages. The stock of horned cattle is said already to reach 30 millions, and cattle-rearing among other farm industries is being wisely encouraged by the Government. The States of Sao Paulo, Rio Grande du Duel, and Rio de Janeiro have installed meat-freezing plants, and the results of the first consignments to Europe have been successful. Among the French colonies, Madagascar and French West Africa should be capable of sending large supplies of frozen meat to the mother country. In France herself, a reform of the industry, and its special cultivation in the regions naturally most favourable to cattle rearing, should lead to improved results.

MARKET REPORTS.

London.—The West India Committee Circular, July 27, 1916.

Arrowroot—2½*d.* to 2⅞*d.*
Balata—Sheet, 3*s.* 5½*d.*; block 2*s.* 9½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 82/-; Grenada, 73/- to 78/-; Jamaica, full rates.
Coffee—Jamaica, no quotations.
Copra—£31 5*s.* to £32 5*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/6 to 3/6; concentrated, £23; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—4*d.* to 3*s.*
Nutmegs—9*d.* to 2*s.* 8*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/10; fine soft, no quotations; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Joffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·49c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 17, 1916.

Cacao—Venezuelan, $17·00 to $17·25; Trinidad, $16·50 to $17·00.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$5·50 per 100 lb.
Dhal—No quotations.
Onions—$4·00 per 100 lb.
Peas, Split—$11·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $7·50 to $7·75; White., $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., Augu 23, 1916; T. S. Garraway & Co., August 22, 191

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·00 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·85 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manur quotations; Sulphate of ammonia, $105·00 to $110· per ton.
Molasses—No quotations.
Onions—$3·69 to $5·00.
Peas, Split—$9·65 per 210 lb.; Canada, $6·00 per 120
Potatoes—Nova Scotia, no quotations.
Rice—Ballam, $7·55 to $7·75; Patna, no quotation Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, July 31, 1916; Messrs. Sandbach, Parker & Co June 30, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	5c. per lb.
Balata—Venezuela block	—	—
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	19c. per lb.
Cassava—	—	—
Cassava Starch—	—	—
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	12c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	—	11c. per lb.
Dhal—	$6·75 to $7·00	$7·50 to $7·75
Green Dhal	—	—
Eddoes—	$1·32	—
Molasses—Yellow	None	—
Onions—Teneriffe	2½c.	$9·00 to $10·00
Madeira	—	—
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	—	—
Plantains—	24c. to 48c.	—
Potatoes—Nova Scotia	—	$4·80 to $5·00
Lisbon	—	—
Potatoes—Sweet, B'bados	$2·40	—
Rice—Ballam	$7·00 to $7·25	—
Creole	—	$6·75 to $7·00
Tannias—	$2·40	—
Yams—White	$2·64	—
Buck	$2·64	—
Sugar—Dark crystals	$4·50 to $4·60	$4·50 to $4·00
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	—	—
Molasses	—	—
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	—

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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Safeguarding the Future by Sound Agricultural Policy.

DURING an official visit to the Leeward Islands this month, the Imperial Commissioner of Agriculture (Dr. Francis Watts, C.M.G.) delivered an instructive address before a well attended meeting of the Antigua Agricultural and Commercial Society, at which His Excellency the Governor presided.

After referring to the prosperous conditions now obtaining in Antigua as the result of large crops and high prices, and to the pleasant experience of meeting the Society under such conditions, Dr. Watts pointed out that in former times their outlook on the future had been dominated by the pressure of necessity, and energies had been centred on finding the best manner of getting through the troublous times without being overwhelmed: the problem had been—How to carry on? Now with the relief from dread, there was a danger that men might be content to continue to follow this policy—which was no policy—that of mere carrying on, being content to deal with the problems of the day as they arose.

It seemed to him that prosperity, or the relief from immediate economic danger, lays upon the men of the community the duty of looking forward, of using the means of the present to safeguard the future, the duty of framing a definite policy, or series of policies, to ensure welfare in times to come.

The framing of policies might be regarded as the work of individuals or the work of communities. Now, while undoubtedly the efforts of individuals were all-essential to progress, these efforts must be directed to common ends if communities were to advance and prosper. It would be readily seen that individual efforts might be very vigorous and active, but those efforts might be directed in different ways, they might clash and be opposed to each other: one party might overpower another and no real progress might result. What was needed was the direction of individual effort to ends of common interest. It required the formation of a sound public opinion.

Now in such work as this Dr. Watts thought institutions like the Antigua Agricultural and Commercial Society could play a most important part, and it was gratifying to feel that this Society was actually playing such a part and making its influence felt throughout the community; that associated with the Agricultural Department, it was moulding public

opinion and diffusing knowledge upon which sound opinions might be formed.

Dr. Watts then congratulated the Society on the success which had attended the various co-operative movements in Antigua, mentioning the good work done by the Antigua Onion Growers' Association, and the influence that the Cotton Growers' Association and Lime Growers' Association might be expected to have on the industries involved.

Continuing, he emphasized the fact that in framing sound policy for the immediate future, sound public opinion was essential; but that implied sound thinking on the part of leading men in the community: no one, not even the most brilliant leader, acted entirely on his own initiative: he was the product of his surroundings; he was the man who had the courage and the energy to give form and expression to what many were feeling and thinking. Hence it followed that to produce sound opinions, even in leaders, implied the inculcation of sound ideas in the community from which the leader sprung.

In agricultural matters, therefore it followed that to have sound policy dictated, we must have sound knowledge disseminated. This led the speaker at once to a point that was worth pressing on the meeting's attention—sound agriculture means sound instruction. It did not always follow that this instruction must be formal: successful planters, successful leading men, were constantly arising who had received little formal instruction; but if one looked carefully at these men, one would find that they had the ability to derive and apply information gleaned from informal sources. That did not however imply that they would not have greatly benefited if the information they wanted could have been presented to them in a more readily available form, but it did imply that many who might be able to use the information and who, being informed, might help to advance the welfare of the business in their hands, miss the opportunity for lack of help and well arranged information. If therefore we wanted progress, we must see to it that we give instruction to those who in due time will have the work of the community in their hands.

This, added Dr. Watts, led to a plea—which should be a demand—for the providing of facilities for proper teaching.

The speaker then referred to the facilities existing in Antigua for agricultural instruction. He alluded to the Grammar School, the Botanic and Experiment Station, and pleaded for further facilities for research work. He made reference to the movement which has been inaugurated for the erection of a laboratory and workshop at the Grammar School, and spoke of the various experiments conducted by the Agricultural Department. Mention was made of the various publications issued by the Imperial Department of Agriculture and the opportunity afforded by these of obtaining information of an educational and practical value.

He did not think however, that the opportunities existing in Antigua for obtaining information were sufficiently appreciated, and utilized, and he indicated how agricultural investigations might be used as a means of providing material for instruction.

Continuing, he said he would leave aside the question of agricultural teaching in all its forms, and turn to the question of the moment—the framing of sound policies for immediate and future application. For this it was essential that one thought about problems—that we set aside the idea of just carrying on.

Many things confronted those present, but the speaker thought he might be allowed to indicate one or two which seemed to him to be worth considering, leaving untouched a long array of subjects which might claim their attention.

As regards the manufacture of their staple product sugar, much care and thought had been bestowed of late years on the perfection of this, and they were rapidly attaining to a sound position in this connexion. The manufacture of sugar in respect to a large part of the crop was carried on with a very high degree of skill, and with the minimum of loss. Antigua was now well informed on this point; it was realized from experience and local demonstrations what could be done, and it only remained to round off the story by completing such plans as would lead to all the sugar of the island being properly manufactured. Sound policy and sound public opinion had arisen in this respect, and there was good ground for thinking that things might go well.

But it was often remarked that where the manufacture of sugar was well conducted, the growing of the sugar was often imperfectly done. Dr. Watts was not at all sure that in Antigua at the present moment, there might not be some danger in this respect; it might be felt by some that the development of the sugar industry was ensured because marked progress had been made in one aspect of the industry. There might, however, be lacking, a policy in respect to the other aspect, that of growing.

So far as one could see, there was good reason for hoping that the sugar industry would be relieved of some of the disabilities under which it has laboured for generations past, and that it might meet with fair play in the world's market. There was reason too to hope that the prices obtained for sugar would be such as, coupled with the improvements effected in manufacture, would make the industry a remunerative one.

One must not, however, overlook the fact that so soon as things begin to adjust themselves after the war, there would be keen competition in the sugar producing countries competition was being vastly stimulated by the high prices now prevailing. Cuba, Hayti, San-Domingo, Porto Rico to name important sugar-producing countries near at hand - Java, Hawaii, the Philippines and parts of South America were all being stimulated, while new countries including large areas in Africa were being induced to devote attention to the industry.

Nor must we overlook the influence of Germany and Austria, great sugar-producing countries now held in check by the war, but which sooner or later may be busily at work endeavouring to regain something of their lost supremacy; and while their sugar may be, and we trust will be, excluded from British and Allied countries, they would make strenuous efforts to force their sugar upon such markets as might remain open to them. This might have the effect of lowering the general price of sugar. In any case West Indian planters would do well to exert themselves to the utmost to gain all such advantages as might be open to them; and to this effect Dr. Watts felt that they would be well advised now to give much thought to matters pertaining to sugar-growing: to create a sound policy in this regard.

The speaker asked as to what aspects of sugar-growing may thought be directed. There seemed to be several. First came the question of manuring: this had had very long and careful attention at the hands of the Agricultural Department, and certain very definite conclusions had been arrived at.

Dr. Watts then gave details of the various questions in connexion with the manurial requirements of sugar-cane that had been worked out by the Agricultural Department from time to time, pointing out the need for organic manures and, under certain conditions, artificial nitrogenous manures for ratoon canes. He briefly touched on the new series of manurial experiments started by the Agricultural Department, and indicated that as the majority of the canes grown in Antigua were weighed, the study and analysis of these weights by planters would yield valuable information. Questions pertaining to stock, the manufacture of pen manure, and the growing of green dressings were dealt with. He pointed out that the rotation of crops had not received sufficient local attention. It was indicated that the many problems connected with the tilth of the soil could only be dealt with by agricultural officers with difficulty, but that they could be more readily studied by planters themselves, because the work of the latter brings them into close association with the land.

Dealing with stock raising, the speaker said that it was now acknowledged that scientific inbreeding of stock was practical for the improvement of herds. Without sufficient knowledge, however, this might lead to considerable harm being done. He indicated some lines of work that might well have consideration.

When speaking about sugar-cane pests and diseases, he alluded to the present position as regards the hard back grubs (*Lachnosterna* sp.). These were apparently not doing much damage at the moment. The fact that their depredations were not strikingly noticeable was probably due to the good weather that was being experienced. These pests are root trimmers, and when the weather is such as to allow vigorous plant growth, roots are formed rapidly and these take the place and perform the functions of those destroyed by the grubs. A spell of dry weather would possibly show up the damage done by these pests. He reminded his audience of the value of trap crops of maize, and the value of crop rotations in connexion with controlling these pests.

Dr. Watts spoke at length on the question of pig raising, and pointed out the present shortage of pork and bacon in the world's markets. It was not suggested that pigs should be penned, but that they should be allowed to run in enclosed areas in fields. These could be planted with food crops, and the herds moved from place to place in the field. If this system were adopted, it would however be necessary to provide strong movable hurdles. He indicated that bacon curing was possible in the West Indies, seeing that with the aid of refrigerating machinery, the difficulties due to climate may be readily overcome.

Continuing, he thought, that by way of conclusion he might say that the main points he wished to impress to-day were that real, steady progress would be the outcome of definite conscious thinking, directed towards the framing of a definite policy in connexion with each agricultural problem; that a time of relative prosperity should be the time when this effort to frame sound policies should be most readily and fully exerted: it was wrong to regard it as the time when things might take care of themselves.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. J. Brooks reports that work in the Experiment Stations in the month of August was similar to that in the month previous; in addition various ornamental plants were put in. Plant distribution included the following: 6,200 lime plants, 10 ornamental, 450 cassava cuttings, and 106 packets vegetable seeds. In the Botanic Station, the work on improvements to roads and entrances was continued. As regards staple crops, cacao gives promise of a good crop; the lime crop is characterized as very heavy, while sugar-canes are said to be making good growth. The extension of lime cultivation continues. The Imperial Commissioner in passing through St. Lucia on August 24, visited Government House and discussed matters of agricultural interest with His Honour the Administrator and the Agricultural Superintendent. In returning from Dominica on August 22, the Mycologist of the Imperial Department (Mr. W. Nowell) made a short visit to the Castries Gardens and discussed with the Agricultural Superintendent general matters relating to plant pests and diseases.

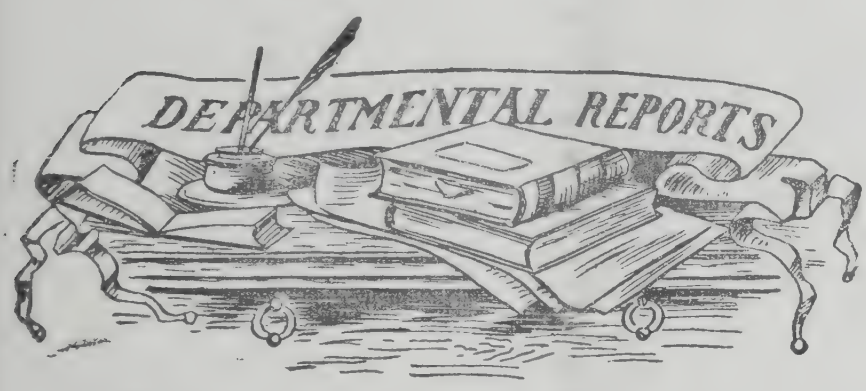
An item of work in contemplation mentioned by Mr. Brooks is the enlargement of the Government Lime Juice Factory. In additional notes having reference to this matter, the Agricultural Superintendent states that owing to the great increase in the peasant produce presented at the Government Factory, it was not possible to accept any juice from planters throughout the month. This juice is being stored, and it is hoped to be able to handle it as soon as the rush is over. On several occasions it has been found necessary for the staff to work throughout the night in order to cope with the daily purchases of limes. Thirty-five casks of concentrated juice were prepared during the month, and now await shipment. The Ellis oil engine has not proved equal to the continuous strain, and breakdowns have occurred. A Crossley engine is expected from England shortly, and this will relieve the situation. Further extension of the building has been undertaken to accommodate the large locomotive boiler that is expected to be delivered from England in November. The new boiling vats and still which arrived recently have been erected, and are used for storing raw juice pending the arrival of the steam coils, etc.

The following Agricultural Credit Societies have been formed and duly registered: Dennery, Souffrière, Choiseul, and Micoud; others are in course of formation and will be registered shortly. Towards the end of the month weather conditions became abnormal. Heavy rains were experienced on Monday the 28th, particularly at the northern end of the island, where the various estates registered from 2 to 4 inches in a few hours. The rivers rose rapidly, and some estates suffered damage from flooding, which carried away the lime crop that had fallen on the Sunday. One estate is said to have lost 200 barrels of fruit, and another suffered heavily by having a large number of lime trees washed away.

MONTSERRAT. Mr. W. Robson writes to say that similar results have been obtained in the Experiment Stations with seeds of the ajowan plant as with seeds of the Bay tree; in unprotected beds they refuse to germinate, but shaded, they grow well. Experiments are in progress to counteract the damping off disease of onion seedlings. Plant distribution during the month of August comprised the following: lime plants 2,900, Bay plants 2,430, sweet potato cuttings 900, fruit trees 10, white velvet beans 8 lb. Seven distillations of Bay leaves are recorded for the month, making a total of 4,000 lb. of leaves reaped to date from Chateau plot for 1916. Three hundred and seventy pounds of onion seeds were received and distributed and much more, adds Mr. Robson, could have been sold. The reaping of the cotton manurial experiment plots in the Botanic Gardens has commenced. Concerning staple crops, it is stated that, ample rains having fallen, the cotton crop, on the whole, has seldom looked more promising, one estate at Windward having already made 200 lb. of lint per acre. On the main area at Leeward, picking has just commenced, and dry weather is desirable to facilitate reaping. So far there has been a remarkable freedom from pests and diseases: cotton stainers do not seem to be very numerous anywhere: attacks of worms have been mild—a contrast to last year. The lime crop suffered severely from a dry June, and the limes being reaped are small. Fields hitherto healthy and vigorous do not at present look so. Concerning this, Mr Robson suggests a connexion between the unhealthy appearance of the limes and the attempt to develop a large crop on an insufficient rainfall. The rainfall has suited the area planted in ground nuts, which at present look promising. Areas in corn are badly infested with what appears to be the corn stalk borer. The rainfall at Grove Station was 8·81 inches, well distributed. On several occasions the weather had been threatening and very high wind occurred on the evening of the 28th. Little damage seems to have been done to crops.

ANTIGUA. According to Mr. J. Jackson's report, work in the Experiment Stations during the month of August was of a routine nature. The following plants were distributed: coco-nuts 72, miscellaneous decorative 135, economic 8, onion seed 949 lb. of which 376 lb. were distributed in Antigua; and 2,000 sweet potato cuttings. A considerable amount of nursery work has been done during the month, numerous Bay and Eucalyptus plants having been raised. Concerning staple crops, Mr. Jackson says the young cane crop continues to improve; its condition is equal to or perhaps slightly better than it was this time last year. Onion seed has germinated well in some places. Approximately 65,250 lb. of cotton was obtained from last year's crop. The quantity of crystals manufactured to date at Bendals factory was 2,500 tons; at Gunthorpes, 11,600 tons. Two visits were made to English Harbour by the first assistant in connexion with agricultural instruction; the total quantity of selected seed distributed to date was 2,605 lb. Good weather for crops in general has been experienced during the month, the rainfall being 5·69 inches; for the year, 34·96 inches.

ST. KITTS. The Agricultural Superintendent reports planting and reaping operations in the Experiment Stations, and the distribution of 375 lb. white velvet beans, and 30 lb. Rounceval, during the month of August, while in the Botanic Gardens general routine work was carried on. As regards staple crops, Mr. Shepherd states the old cane crop is still being reaped on a few estates in the northern district. The young cane crop, generally speaking, is well advanced and healthy. With a continuance of the present favourable weather, the prospects for the next season are very promising. On two estates in the northern district cotton is being picked and ginned with good returns. The younger cotton in the valley district is bolling well and some promising fields are to be seen. The acreage in cotton has been reduced, but actual figures are not to hand. The cotton is healthy and, so far, the worm has not appeared. Visits were made to Nevis during the month and coco-nut cultivations at Pinneys inspected, and experiments laid out concerning lime requirements of soils. The rainfall for the month was 8·24 inches; for the year, 37·62 inches.



DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1915-16.

The Botanic Gardens suffered considerable injury during the year from severe storms in August and September 1915. This necessitated extra work in connexion with repairing the damage done.

In regard to work in the nurseries, the report states that the distribution of plants has been maintained, though the number sent out was less than in former years. The report then furnishes notes on plant importations. The seeds of *Pouteria suavis*, a fruit tree of Uraguay, two plants Joboticaba a fruit tree of Brazil, some new mangoes, and seeds of an Achras from British Honduras, which yields chicle gum, were safely received and attended to. In the plot experiments at the Botanic and Experiment Stations extensive trials with green dressings have been continued and interesting remarks are given on the value of green dressings in young lime cultivation where the trees are widely planted and have not yet filled in.

After referring to the cessation of the tapping operations on Castilloa rubber trees as well as to the thrifty character of the Robusta coffee grown at the Station, the Report gives an account of the latest results in connexion with the grafted cacao plots.

The investigation into the identity of Dominica grasses and sedges was continued during the year, with the kind assistance of the United States Department of Agriculture, and a list of the species so far determined is given in this Report.

The succeeding section concerns progress in the chief industries. In spite of the fact that the climatic conditions during 1915 were unfavourable, the output of lime products was satisfactory. But on the estates, as in the gardens, damage was caused by the storms of the 1915 hurricane season If the weather had been favourable, the output, which was 390,000 barrels of fruit, would have exceeded the record crop of 1913, which was 391,000 barrels of fruit. In regard to the relative amount of the different lime products exported, the quantity of raw juice and, to a less extent, of concentrated juice exceeded that shipped the previous year. There was a falling off in the shipments of fresh limes and of citrate of lime. As to total value of the lime products exported, there was a total decrease in value amounting to £12,626. The actual figure for 1915 was £174,405.

Concerning cacao there has been for some years a falling off in the industry, which is to be regretted. Progress in connexion with coco-nut cultivation is satisfactory.

An important section of the present report deals with manurial experiments with limes and cacao. Experiments with limes have been in progress only three years, but the plots show very clearly, that the application of complete manures and of mulching is attended by great benefit to the trees as well as by a remunerative increase in crop. It is estimated that the application of complete artificials yields a clear profit amounting to £12 per acre. Experiments are in progress with young trees as well as matured ones, and there are additional experiments being carried on to compare the relative value for manurial purposes of cotton seed meal and grass mulch. An interesting line of investigation is that designed to ascertain whether grass can be profitably grown on adjacent waste land to serve for mulching purposes at a profit. The manurial experiments with cacao have been in progress much longer than those with limes, and the results have been repeatedly referred to in past volumes of the *Agricultural News*, and have been studied in detail in the *West Indian Bulletin*. Suffice it to say that the application of mulch and of dried blood with phosphates and potash is attended by very considerable profit. A useful appendix to this account of manurial experiments is a table giving the chemical composition of pen manures and allied manures suitable for mulching, etc., produced or commonly used in the Leeward Islands.

The next section of the report gives an account of the work accomplished in the chemical laboratory. At the beginning of the year under review the chemical work carried on in the Leeward Islands was reorganized, and branch laboratories were established in Dominica and St. Kitts under the advisory control of the central laboratory in Antigua. The section under review is an account of the first year's work This has consisted principally in analytical work in regard to lime products. The need for improvement in the manufacture of concentrated juice is indicated. The value of steam concentration not only in regard to less sediment but in connexion with reduction of loss of acid is shown by the results of two experiments conducted in a steam plant. Several manures were analysed during the year, and the composition of meat bone meal and Swift brand 003 were found to be satisfactory. An investigation was conducted also into the milk supply of Roseau, the chief town. The composition of the milk appears to be very satisfactory.

A novel line of investigation had regard to the concentration of lime juice by freezing. It has been found that raw lime juice when frozen and treated in a centrifugal can be concentrated without affecting its properties as a beverage—a most important fact. If the juice is treated once only, the acid content may be increased from about 13 oz. per gallon to over 20 oz. per gallon. If this be refrozen, a juice containing 30 oz. per gallon can be obtained. The low testing juices can be converted into citrate of lime, thus eliminating all losses except those of handling. This process enables a very considerable saving to be made in freight, charges and packages amounting to between 40 and 60 per cent., the actual amount depending upon whether the juice is frozen once or twice.

A large number of analyses were conducted to determine the ratio of citric acid to free acid in lime juices. The results obtained will be found of value. The section under review concludes with a report on the waters of Dominica, the published analyses having been made at the central laboratory in Antigua.

Work connected with insect and fungus pests has happily not been as considerable as is generally the case in other islands. The root diseases of lime trees appear to occasion the most serious trouble, and agricultural officers are always on the look out for their occurrence, and ready to give advice as to the necessary control measures to be taken.

The principal section in the concluding portion of this report concerns agricultural instruction in the Botanic Gardens. To show the practical nature and value of this work, extracts from the diary of one of the pupils are reproduced together with a report on the work, by a leading planter. These statements make it evident that the Garden provides a training for would-be overseers equal if not superior to any obtainable elsewhere in the West Indies.

THE ORIGIN OF THE GOLD COAST CACAO INDUSTRY.

In the 'Round the Empire' notes in the April number of *United Empire*, it was stated that the cacao industry of the Gold Coast was founded in 1879 by a native of Accra who brought some cacao plants and pods from Fernando Po, made a small plantation, and four years later sold the cacao pods in the neighbouring villages: it was added that the first shipment of Gold Coast cacao, consisting of 80 lb., was made in 1891. These statements, it is learnt from a note in the *United Empire* for August, were based on information contained in an Annual Report on the Colony for 1902 and on information in a book *Le Cacaoyer* by Chevallier, published in 1908.

Mr. Brandford Griffith now writes to the *United Empire* with the object of dispelling the idea that the introduction of cacao into the Gold Coast was due to a native. From 1884 to 1888, Mr. Griffith was frequently in Akwapim, and he was much interested in all economic products and took some trouble to enquire into the coffee pests and had there been any cacao in the district he thinks it would have come to his knowledge. He goes on to say that at the end of 1886 or early in 1887 (just after the cable had been laid to Accra) his father, the late Sir William Brandford Griffith, who was then Governor, introduced cacao into the Gold Coast. He procured some pods through the cable superintendent at San Thomé, planted some of the seedlings at Aburi, which was then the Government sanatorium, and distributed the rest amongst natives in the Akwapim hills. This, adds Mr. Griffith, was the beginning of cacao planting on the Gold Coast, and Mr. Griffith well remembers seeing and handling the original pods from which the huge cacao industry has sprung, the magnitude of which will be grasped by reference to our article on the Accra Cacao Output for 1915 which appears on page 318 of this issue of the *Agricultural News*.

The Curator's report from Dominica for the month of August shows that operations of a routine nature comprised the work in the Experiment Stations for that period. The Botanic Gardens were severely injured by the hurricane of the 28th, and it will require considerable time to remove the fallen trees and prune the damaged ones. Plant distribution comprised: 4,962 limes, 300 cacao, 500 coffee, 49 budded citrus, 3 grafted mango and 8 miscellaneous, making a total for the month of 5,822. Produce shipped to London included 5 bags cacao, 2 bags kola nuts, and 1 bag nutmegs.

COMPOSITION OF THE COTTON PLANT, AND MANURING.

The *Experiment Station Record*, Vol. XXXIV, No 2, contains a note showing the analysis of cotton at four stages of development, namely, to the first form, the first bloom, the first open boll, and maturity. The cotton plants were grown under various fertilizer treatments and compared with a standard fertilizer consisting of 468 lb. of acid phosphate, 36 lb. of muriate of potash, and 130 lb. of nitrate of soda per acre.

'The obvious indications of these results, as compared with those yielded by application of the standard fertilizer, are that substantial diminution in amount of either of the principal ingredients of the plant's food, phosphorus, calcium, potassium, or nitrogen, involve (1) substantial reduction in the weight (dry matter) of the plant in its entirety and in the several periods of growth, particularly after setting of the form, and 2) the increase in time period from form to bloom, from bloom to open boll, and in the maturing of the plant. The proportion of ash to dry matter at any stage of growth or relative amounts of nitrogen and mineral ingredients does not appear to be seriously affected by the amount of the food supply. This would seem to indicate the important fact of the absence of a power in the plant to store food in any particular period of growth beyond the needs of the plant for the period.'

A study of the effect of various fertilizers on the fat content of the seed produced in these experiments showed that 'the season affected notably the weight of the seed and the fat content; a similar effect is noted in the total weights of dry matter produced. The fertilizer seems, however, to affect the relative fat content. Assuming the product from the standard fertilizer to be 'normal,' it appears that lack of phosphorus diminishes notably the storage of fat and of potassium and nitrogen to some but a lesser degree.'

ST. LUCIA LAND SETTLEMENT.

The progress of the land settlement on Bannion estate in St. Lucia is shown by the following statement, reproduced from the Report of the Agricultural Department, St Lucia 1915 16:—

SWEET POTATO still remains the favourite crop, and so long as it continues to be the most profitable, it is desirable that no serious change be made. The price realized on the spot varied from 4*s*. 6*d*. to 6*s*. per sack, and in Castries from 6*s*. to 9*s*. 6*d*.

This settlement is fast becoming a productive centre for the Castries market, which is not fully realized except perhaps when the coasting boat temporarily ceases her daily calls, and then the shortage of provisions is keenly felt.

Choiseul, owing to its arable light dry soil, is the chief productive centre of the island for sweet potatoes, and some idea may be formed of the extent of the provision industry in this district when the records show that 2,777 sacks of sweet potatoes, 1,319 bunches of plantains and bananas, 761 baskets of mixed vegetables, and 13 barrels of dry peas were conveyed to Castries from this district during the year by the coasting boat alone; and if records were obtainable showing the amounts shipped by sloop and canoe, this total would be easily doubled.

Many of the small areas in other districts which formerly grew provisions have during the last two years been planted with limes, and in the course of a few years these areas will no longer be available for the production of vegetables. It is therefore necessary for the general welfare of the island that there should be at least one large centre on the leeward side of the island capable of producing and maintaining a steady supply of provisions to Castries. The efforts of the Agricultural Department at Choiseul are therefore chiefly directed towards the developing of the present provision industry, by extending the areas under cultivation, and by the introduction of new and more prolific varieties rather than encouraging the cultivation of permanent or orchard crops.

SUGAR-CANE. New varieties of cane were introduced from Barbados and St. Kitts in 1913, and were carefully grown at the Agricultural and Botanical Station. The varieties giving the best returns under the existing conditions at Choiseul were distributed free during the year to the Land Settlement holders. The cane grown was crushed and manufactured into sugar at the Agricultural Department's sugar works on the usual system of sharing.

CASSAVA follows sweet potato in order of importance, and attention has been paid to the introduction of new varieties from Montserrat. Eleven new varieties were obtained, and after careful trials, cuttings of the two best yielders were distributed for general planting.

OTHER CROPS such as peas, beans, yams, Indian corn, coco-nuts, coffee, limes and cacao are being grown in suitable situations.

Continuous assistance and advice have been regularly given by the officers of the Agricultural Department.

DISTRIBUTION OF FREE PLANTS, ETC.

The following list shows the number of plants and cuttings distributed free during the year:—

Sweet potato	(cuttings)	...	5,000
Cassava	,,	...	5,500
Sugar-cane	,,	...	11,000
Coco nuts	(plants)	...	24
Limes	,,	...	50
Coffee	,,	...	24
Banana	(suckers)	...	500

TRAINING AND INSTRUCTION.

Owing to the Settlement adjoining the Agricultural and Botanical Station, it has been possible to render greater assistance to the Land Settlement holders than would otherwise have been possible.

The labour to work this Station is drawn as far as possible from the families working holdings under the Land Settlement Scheme.

When the Agricultural Superintendent is satisfied that a holding is planted and weeded and requires no further attention for the time being, the owner is employed in the Agricultural Station.

This enables him to be taught the proper tillage of the same soil, growing the same kind of crops as their own lots, and under the same climatic conditions. It also provides them with ready money for their general maintenance while their own crops are maturing. As soon as their own holdings require attention they are sent back, and others taken on to fill their places at the Station.

THE JAVA FIBRE CONFERENCE OF 1911.

The proceedings, published in three volumes, of the Java Fibre Conference held in July 1911, have been received, and the attention of readers interested in such crops as cotton, kapok, agave, Manila hemp, ramie, and jute may be called to these important sources of information. An especially useful paper on the classification of Agaves was read at one of the meetings, and the paper, because of its West Indian bearing, will be reproduced in an early issue of the *West Indian Bulletin*, together with additional information furnished to this Department by the author.

The following are brief summaries of three papers read on Javan kapok, pine-apple fibre, and cotton. It will be remembered that Javan kapok is the first grade commercial standard recognized all over the world.

KAPOK.

Kapok is a good secondary crop for the native population, but measures must be taken to prevent stealing and picking of unripe fruits.

European estates based on the cultivation of kapok may be profitable, but the profits are usually small. It is recommended that kapok cultivation may be combined with cacao, coffee, etc. or with cattle rearing.

The consumption of kapok for several purposes is increasing all over the world, and, so far as can be seen, there is no fear of overproduction.

The exports of kapok from other tropical countries are as yet unimportant, but officials in other countries, where kapok may be grown, are encouraging its production so that in future competition may be expected.

It is therefore recommended by this congress, that measures be taken to prevent any falling off in the quality of Javan kapok, in order that it may retain its reputation as the most valuable and best prepared kapok in the markets of the world.

PINE-APPLE FIBRE.

As regards the production of pine-apple fibre, the general conclusions arrived at were:—

It is found that well prepared fibre also made by the natives, is suitable for many purposes The demand is as yet irregular and there is no established market, but it is expected that a market for pine-apple fibre may soon be developed.

It is found, thanks to the experts, that the fibre has many good qualities, so that it merits attention, and it may become of commercial importance in European industries.

Before a just conclusion may be reached, we must await:
(1) the results of several experimental plantations in different parts of the Archipelago.
(2)Trial in the preparation of the fibre for market.

COTTON CULTIVATION IN PALEMBANG.

The following shows that the agricultural authorities in Java are alive as to the difficulties confronting the production of cotton:—

It will be an important advantage to the cotton cultivation in Palembang to make regulations as at Lematang-Ilir (that is reserve for cotton grounds suitable for it).

Lands for cotton must not be permitted to be over-run with alang-alang.

In regions where cotton is growing or may be grown profitably, fields should be reserved for seed gardens.

Sufficient positive data for making satisfactory estimates cannot be obtained.

If the native cotton cultivation in Palembang is left to itself, the industry is not likely to expand.

The prospects are favourable for native cotton cultivation in Palembang if European capital comes in for installing gins and buying the product.

Native cotton cultivation may be encouraged by giving demonstrations, and by organizations for farmer's banks.

The prospects for European cultivation of cotton are not unfavourable, especially if carried on in connexion with other crops. (Mixed farming).

There are no figures for making estimates regarding European cotton cultivation in the Dutch East Indies. Some difficulties regarding labour may be expected.

The prospects for European cultivation of cotton may be more favourable if the Government and those interested in cotton combine—

(1) for securing information.
(2) for establishing a cotton experiment station.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents and the subscription and advertisement rates will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue

The editorial in this issue consists of an address delivered before the Antigua Agricultural Society by the Imperial Commissioner of Agriculture.

On page 309 will be found a review of the annual report of the Dominica Agricultural Department for 1915-16.

An interesting account of how a Government may assist in marketing colonial produce will be found on page 315.

A review of an interesting book on the chemistry of plants and animals is to be found on page 317.

Insect Notes concerns the dispersion of the house-fly while under Plant Diseases is an article on a rot of Hevea stems.

The Agricultural Situation in the Philippines

A comparison of the present agricultural situation in the Philippines with the situation existing ten years ago clearly shows that there has been a remarkable degree of progress when one takes into account existing economic and social conditions. The purpose of an article in the *Philippine Agricultural Review*, Vol. IX No. 2, is to describe briefly the more important lines of development in Philippine agriculture during the past decade and also to show in what measure this development is being promoted by the work of the Government.

In the course of this article notes are given concerning the development of the rice, corn, cocoanut, sugar, tobacco and fibre industries. The value of the annual exports of sugar have increased over 700 per cent. in the last ten years, while in the case of tobacco the increase has been 100 per cent. in the last five years. In regard to rice, much larger returns are now obtained per acre, while a thoroughly organized rice campaign in connection with seed selection has had an even more pronounced effect in regard to this industry. As pointed out in the last issue of the *Agricultural News* there has been some dissatisfaction on the market side of the manila hemp industry, but the amendment of the grading law has now re-established this industry on a thoroughly satisfactory footing.

In regard to pests and diseases, the Philippine Government has carried on several vigorous campaigns against rinderpest, locusts and the cocoanut leaf rot. The public services division has been responsible for useful seed selection and distribution work, fibre inspection and for carrying on the final production campaign immediately following the outbreak of the European war. On the educational side the Government has done a large amount of work by means of co-operative demonstrations and by organizing in each province and municipality a co-operative agricultural society.

During the past ten years the investments of capital in Philippine agriculture have been small and Government appropriations have been limited. That there has been progress, however, and a marked degree of progress is clearly demonstrated by the information contained in the article under review. And it should be added that the people as a whole owe a debt of gratitude to the Philippine Government for furnishing the necessary funds for the valuable research that is being carried on by the Bureau of Education.

Trade and Exports of the British Solomon Islands.

In *Colonial Reports—Annual* (No. 949) for 1914-15 is presented the Report of the High Commissioner on the British Solomon Islands Protectorate for 1914-15. From this the following information, which should be of interest to readers of the *Agricultural News* is abstracted.

The production of copra, the principal item of export, is steadily increasing. Coco-nut plantations that were established some eight years ago are in bearing, the average crop being up to the most sanguine expectations. A falling off of the produce from native trees has resulted from the fall in price of copra, as the natives, not understanding the cause of the drop in price, were reluctant to sell, and preferred to let the nuts rot on the ground rather than accept the lower price offered by traders.

As regards ivory nuts, another important item of export, it is stated that the closing of the market for this item has been a serious blow to the Protectorate. Ivory nuts are grown extensively throughout the group and the export provided a profitable living for a number of small traders. Prior to the outbreak of war the price paid was £11 per ton. At the present time there must be many hundreds of tons going to waste: even at the reduced price of £6 to £7 the industry would find employment for many, and quite £20,000 in value would be realized annually. The loss of this item of trade has not been made good by any other item.

Another item of export is bananas. The prices realized on the fruit shipped have been very encouraging, and that fact, it is submitted, should induce other persons, besides the few growers in the eastern part of the group, to take up the cultivation of this highly remunerative product.

The cultivation of cotton has been abandoned, mainly owing to the scarcity of suitable cheap labour to gather the crops.

The Protectorate has been found to be well suited for raising cattle, and many plantations have herds grazing among the coco-nuts, thus saving a great number of labourers in the clearing of undergrowth.

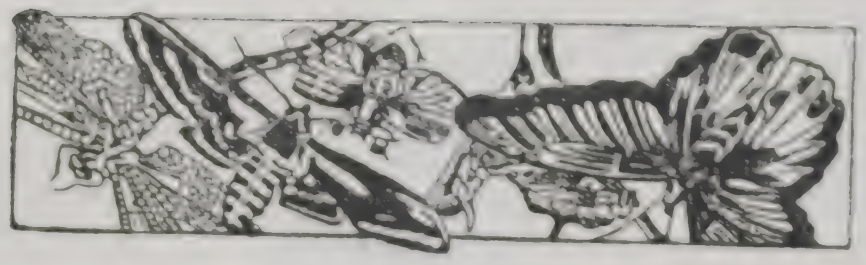
Science and Practice in American Farming.

An editorial of a very enlightening character appears in the *Experiment Station Record* (Vol. XXXIV, No. 2) on the subject of extension work, that is, the educational movement to disseminate the results of experiment station work and put them into actual practice. When the extension legislation was being considered in the United States, confident predictions were made as to its great value, and it was even suggested that a point has been reached when experiment station workers could afford to pause in their labours in acquiring exact information, and devote more time to disseminating it and helping the public to 'catch up.' The right course is to continue both: it is as well, however, to recognize this fact, that experimental work may tend to run ahead and leave those it is intended to help along, in the back ground. One pauses to think of this, more especially as the idea emanates from the United States, where the obligation of the work of the experiment stations in promoting agricultural advancement and improving farm practice has from the very first loomed largeon the horizon of the station workers. If in the United States the danger is recognized, there is probably good cause for expecting it to exist in other countries.

We may think of science as the relation of cause and effect. It is this knowledge of cause and effect which enables us to construct and construct with confidence. Practice is only effect; it seldom takes cause into account. We can never be certain that practical operations will produce the same effect because we do not fully understand the forces operating to produce the effect. This is where practical experience breaks down, and especially so in agriculture. The great value of extension work lies in explaining the inner meanings of practical experience, thereby enabling us to conduct practical work with greater confidence in regard to achieving the desired results.

Campaign Against Food Plants of the Cotton Stainer.

In the Gleaning's page of this issue reference is made to the Ordinance passed on July 25 in St. Vincent to make provision for the eradication of the pest known as the cotton stainer by means of cutting down the native food plants of the pest which are chiefly the silk cotton tree and 'John Bull' (*Thespesia populnia*). This work was commenced the day following that on which the Ordinance was assented to and a report has been received from the Agricultural Superintendent, Mr. W. N. Sands, on the progress made during the period July 26 to August 31. The magnitude of the work, which is very considerable, will be appreciated by referring to the details published on page 319 of this issue. It will be noticed that while the Government is meeting the necessary expenses, chiefly connected with labour, the planters themselves are actively co-operating with the Agricultural Department in order that these trees which harbour a pest that is a menace to the cotton industry may be entirely eradicated. For the information of those readers who have not followed the history of the cotton stainer problem in St. Vincent it may be briefly explained that the stainer is responsible for infecting unopened bolls with a fungoid disease and that while there is a strict close season for cotton growing in St. Vincent the stainers have been observed to carry over only too successfully on certain wild plants notably the trees mentioned above, namely, the silk cotton tree and John Bull. The present campaign is an interesting example of the practical value of scientific observation and reasoning supported by strong Government action in saving a staple crop from destruction by disease.



INSECT NOTES.

THE DISPERSION OF THE HOUSE-FLY.

Effective control of the house-fly is a world-wide problem of the greatest importance, intimately associated with the maintenance of public health. Two papers in the American *Journal of Economic Entomology* (Vol. 9, No. 3) add considerably to the knowledge required to achieve this end. The first paper deals with the subject of the migratory movements of the fly, and the following is a summary of the data and results obtained in an extensive experiment.

In a city, the built-up portion of which was about 1½ miles square, 387 877 marked flies were liberated from four release points. The release points were so located as to give an idea of the possible spread of flies from breeding areas variously situated in relation to the city as a whole, and each representing different conditions.

A total of 1,056 flies were recaptured at seventy-eight stations, which varied from 50 to 3,500 yards from the point of release. This was the greatest distance at which recaptures were attempted.

The results indicated that under conditions which are favourable, flies may spread from any given breeding ground to all parts of a city, even one of considerable size. Also that they may not only cross a city offering abundant feeding and breeding areas, but may even leave it and cross open country to points considerable distances beyond its limits.

The full possibilities of dispersion were not determined, due to the relatively small size of the city, but the fact that the flies spread from release points on one border to points on the opposite side, indicates a possible radius of 2,333 yards (1⅓ miles), and that flies even traversed the entire city and crossed open country to points beyond, justifies the belief in a still greater radius. The actual territory over which flies were recovered in the city was about 2 square miles, but possible dispersion over a territory of from 5 to more than 12 square miles was indicated.

While the results of this investigation are of general application to Montana cities and towns, it is problematical to attempt to apply them to more thickly populated areas, where sanitary measures are more easily and more generally applied. Control measures mean fewer flies and fewer feeding and breeding areas but does this mean a larger or a smaller radius of dispersion for what flies there may be?

SUMMARY OF DEDUCTIVE RESULTS.

House-fly dispersion (the spread of house-flies from their breeding grounds and the factors controlling it) may be considered as a problem concerning short periods of time or as one of seasonal significance.

The factors which control dispersion are mainly, if not entirely, external stimuli. As regards their effect on the radius of distribution, these stimuli may be termed *inciting* (e.g., odours from feeding and breeding grounds), or *inhibiting* (e.g., low temperature, rain). Inciting stimuli give rise to tropic reactions, movements to and from, and consequently have a direct effect on distribution. Inhibiting stimuli indirectly affect distribution, because of resulting periods of inactivity on the part of the fly.

These stimuli, both inciting and inhibiting form a complex set of external-forces each of which varies in intensity and duration.

The adult life of the house fly is essentially devoted to two purposes, feeding and reproduction. Hence, it is evident that when dispersion is considered as a problem of long periods or of seasonal duration, the stimuli from feeding and breeding areas are those of the inciting stimuli which act most continuously and for the greatest portion of a fly's life and are the most important ones to control. Temperature is a constantly present stimulus, but may be inciting or inhibiting.

When dispersion is considered for short intervals, other stimuli than those from feeding and breeding areas may assume greater importance. These stimuli may be inciting or inhibiting, and under normal conditions have but minor significance as seasonal factors. Cities or localities undoubtedly occur, however, in which unusual physical or meteorological conditions are present with but slightly varying intensity during a complete season, and consequently what would ordinarily be a stimulus of minor importance may become one of major seasonal importance (e g., strong wind blowing constantly from some direction, long continued rain, etc.).

By conducting dispersion experiments with a sufficiently large number of flies for a sufficiently long time, and by covering a sufficiently large territory, it seems likely that a limit for fly dispersion, under city conditions, could be determined which would be of more or less general application. The length of time would have to be at least equal to that of the average length of house-fly life

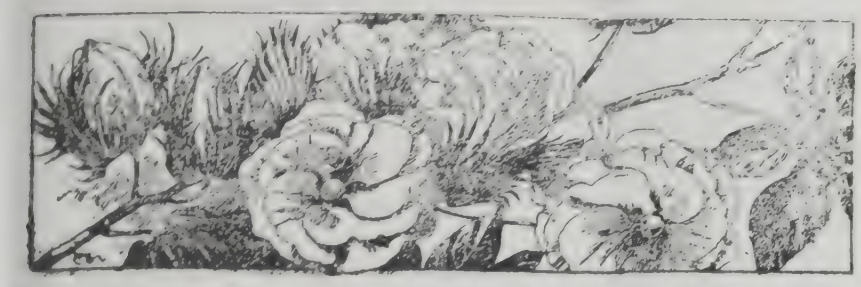
DESTRUCTION OF LARVAE.

The second paper concerns the breeding habits of the fly. It was found that the development of eggs and larvae in manure was inhibited by all strengths of hydrochloric acid: though the pupae develop from both acid and alkali which is prohibitory to the eggs and larvae. Manure stored in bins was found not to be a good place for the breeding of flies, due to the growth of mould.

It has been found possible to destroy the larvae of the domestic fly by merely turning the inner parts of the pile over the fresh manure which contains larvae. The heat generated by the manure, as well as the gases which are formed during fermentation are very fatal to the larvae when they are exposed to them. This is a result of much practical importance owing to the simplicity of this method of control.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on September 20 by the C.R.M.S. 'Chaudiere', after having paid an official visit extending over a month to the Leeward Islands.



HOW HAWAII HELPS HER FARMERS TO MARKET THEIR PRODUCE.

In the West Indies, Antigua affords the best example of an island where the Agricultural Department assists in the marketing of locally grown produce. In this connexion reference may be made to the Antigua Onion Growers' Association, to the Government Granary and, to a less extent, to assistance rendered by the Department in connexion with the sale of cotton. In the American tropical territory of Hawaii, a great deal more than this has been done to develop the production by the establishment of a territorial market, under the supervision of the Hawaiian Experiment Station. Mr. E. V. Wilcox, of the States Relations Service, gives an account of what has been done in an interesting article in the *Yearbook* of the United States Department of Agriculture for 1915. In this he says that prior to the establishment of the market, fruits to be obtained in Honolulu were mostly imported, and the same held good to a large extent in the case of vegetables. When it was asked why Honolulu markets were not properly supplied with tropical products, the farmer replied that the dealers apparently did not want such produce, or at any rate would not pay enough for it to give the farmer a profit; while the dealer replied that either the produce in question could not be profitably grown in the territory, or the farmers were not sufficiently industrious to engage in any special line of agriculture.

To understand how such a situation arose necessitates a study of the economic history of the territory. It is sufficient here however, to indicate the action which the territorial legislature took to remedy it and to bring about a development of diversified agriculture. In 1909 a Commission recommended the establishment of the territorial market, and in 1913 this market, which had been in existence for two years, was brought under the supervision of the Hawaiian Agricultural Experiment Station.

The difficulties attendant on the production and sale of produce by the amall estate owner were considerable until this market began operations. In the first place they could not individually produce large enough quantities of material to secure reduced freights. Moreover, the individual small farm could not be allotted to different crops in such a manner as to bring about a steady supply. The worse feature of all from a standpoint of the small farmer was that no market information was available in any of the local newspapers. Another serious difficulty was furnished by the uneven nature of the land, the prevalence of insect pests and fungus diseases, the unusual heaviness of the soil, and poor roads. In fact the whole field of diversified agriculture in Hawaii, was until quite recently neglected by reason of the intense interest in the production of sugar. There was also to be faced competition with produce shipped from the United States and the Orient: peanuts were imported in large quantities from China and Japan, beans from the mainland, corn from Seattle and Manchuria, oranges, grape fruit, carrots, beats, asparagus, potatoes, and various vegetables, as well as cold storage, chickens and turkeys from California, and onions from Texas and Australia. Therefore without any information as to the actual condition of the Honolulu market, it was practically impossible for the farmer to prevent glutting the market by making a shipment to Honolulu.

The first work of the territorial market was the encouragement of organizations among farmers. Great difficulty in this respect was met with because of the great diversity of races and languages, English itself being by no means a universal language as it is in many other cosmopolitan places.

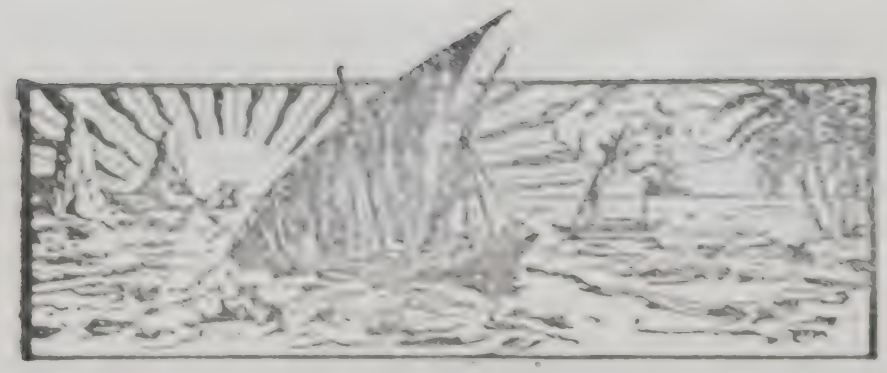
Through the medium of pigeon English, however, the universal business language of the Orient, and by enlisting the interest of representatives of various races, quite satisfactory co-operative associations have at last been formed in the various farming communities. The simplest form is a mere voluntary organization of farmers who pool their produce and ship it in common in the name of the organization to the territorial marketing division. One association on the island of Maui is composed exclusively of American farmers. Their main crop is pine-apples. They were induced to take up land in this locality by contract with the local cannery, which agreed to take their pine-apples on a sliding-scale system regulated by the price of canned pine-apples. Unfortunately after the arrangement had been made the price of fresh fruit was reduced one-half or more, and the farmers were brought face to face with a new emergency; but a movement was at once started to establish a co-operative cannery for handling the fruit of the community; the first crop was sold fresh to the territorial marketing division. In a neighbouring community, corn, beans, cabbage and poultry are the main products for sale. The community does its business through an elected manager, who makes shipments to the territorial marketing division for sale in Honolulu or for reshipment to San Francisco.

In order to keep the farmers in the different islands informed as to prices and demands, a market letter is circulated, printed in different languages. On their side, the farmers have been induced to supply the division fortnightly with information as to the kinds and amounts of produce which they are likely to have in the near future for shipment to Honolulu. This system of mutual exchange of information tends to prevent the flooding of the market.

As the result of the establishment of the Hawaiian territorial market, the demand for local produce in Honolulu has greatly increased in every direction. This not only applies to fruit and vegetables but to the supply of poultry and meat. Little Indian corn is now imported, and the reader will remember that efforts are being made to reach a similar position in Antigua, in the West Indies.

One good effect of the co-operative marketing has been that the steamship companies have taken greater care and provided better facilities for the transportation of perishable produce. Simultaneously, the farmers themselves have graded and packed their produce in a more satisfactory manner than previously.

In the course of the article from which this information is obtained, reference is made to a recent shortage of onions which are derived from the Bermuda crop. This stimulated local production, satisfactory prices were obtained, and no difficulty was experienced in shipping onions from Honolulu to San Francisco. Similarly with sweet potatoes; while from time to time it has been found pofitable to ship dry beans. In order to facilitate business on the American Pacific Coast, the Hawaiian territorial market has a branch market in San Francisco. Its main business thus far has been the handling of fresh pine-apples, but in the future it will no doubt be concerned with the disposal of other products.



GLEANINGS.

As the result of an investigation at the University of Illinois it has been shown that dolomite up to 40 per cent. proves beneficial to plant growth. The results indicate that dolomite and magnesian limestone will not be detrimental as applied in agricultural practices. Increasing the size of application increases the calcium and magnesium contents of plants. Details of the investigation will be found in the *Journal of Agricultural Research*, Vol. VI, No. 16.

It is interesting to learn that in Canada the use of formalin by the farmers themselves for disinfecting seeds has enormously increased of recent years as the result of educational effort. During 1915 approximately 20,000 farms in Ontario treated their seed grain this spring with formalin as a protection against smut. Ontario druggists so far this year have sold to farmers about 4,650 gallons of formalin compared with 1,175 gallons during the whole of 1915.

On July 25, 1916, an Ordinance was passed in St. Vincent to make provision for the eradication of the pests known as the cotton stainer by means of cutting down the native food plants of the pest which are chiefly the silk-cotton tree and 'John Bull' (*Thespesia populnia*). Where substantial damage is occasioned compensation is allow for. An offence against this Ordinance, namely obstructing or impeding the agricultural officers in the execution of their powers, makes the offender liable to a fine not exceeding £20, or in default of payment, imprisonment for a term not exceeding six months.

An article in the *Agricultural Gazette of Canada* deals with the interesting subject of home garden contests conducted on farms in Ontario. The main reasons for their institution are that the pupils having reached the required age, are capable of undertaking more than is called for by the children taking part in ordinary school gardens: secondly, as is well known, a garden is far too uncommon on the average farm. The writer goes so far as to say that a greater number of vegetables are to be found in the back-yard gardens of Canadian cities and towns than can be found on the average farm.

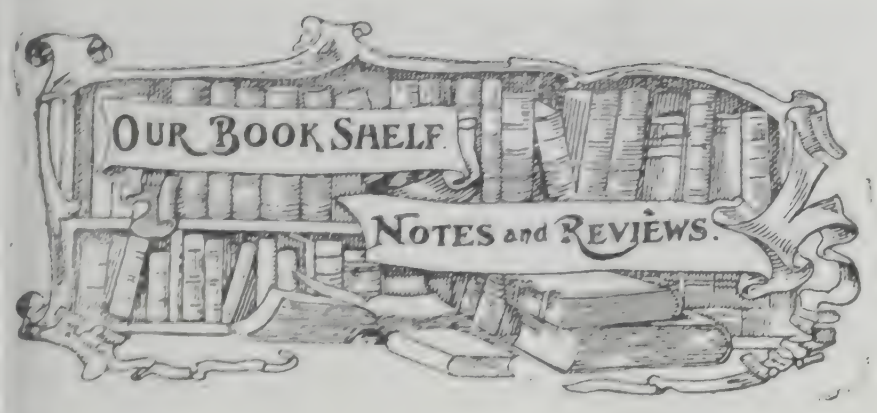
The report of the Education Department of Trinidad and Tobago says that the present expensive system of nature study in the primary schools does not allow a satisfactory attainment of the results that are desired. The Senior Agricultural Instructor and the Junior Agricultural Instructor paid during 1915 nearly 400 visits to the different schools, and in many cases practical instruction to pupils was given. It is difficult to understand why, with this skilled attention, school gardening is not progressing satisfactorily as is desired. In many colonies this branch of education does not receive any expert attention and supervision.

A correspondent, of the *India Rubber World* writ... from Germany on the rubber trade in that country sta... that the manufacture of synthetic rubber in Germa... has been placed on a basis that is com- mercial und... existing conditions. He states that many experts go ... far as to predict that, before the end of the war s... progress will have been made that Germany will be a... to produce this material when peace is re-established, in co... petition with the natural product, and at such prices as ... displace crude rubber partially, if not entirely. They pred... for the rubber plantation the same fate that befell the cu... vation of indigo.

The *Indian Forest Records* (Vol V, Part VII) contai... an interesting note on the economic uses of Rosha gra... (*Cymbopogon Martini*, Stapf.) in India. The paper is chie... of interest in the West Indies in that it shows that approx... mately 20 per cent. more oil can be obtained from a ste... plant than from a direct fire still when using thoroughly w... dried grass. Again, when using steam distillation with d... and green grass 100 per cent. more oil was obtained from t... latter for the reason that the oil has not time to volatilise o... of the green grass. The consumption of fuel when usi... boiler is somewhere about 100 per cent. less than that requi... for a direct fire still These results should interest worke... in lime oil and bay oil distillations in the West Indies b... they require careful criticism.

The *Agricultural Journal* of the Department of Agricu... ture Bihar and Orissa (Vol. III, No. 2) contains an interes... article on the Indian cultivator's method of storage of se... and of seed testing. The latter is a very crude and simp... affair. The media which he selects for sprouting seeds ar... the very watery leaf-stalks of such plants as the plantain. Th... stalks are cut into convenient lengths and then partially... split open to place the seeds inside in contact with the mo... fresh cut surface. The leaf stalks are then tied up and kep... in a moist place. Usually sixteen seeds are taken. Whe... the germination goes below ten the seed is considered to b... bad. It is customary with cultivators to test their wheat... gram, barley, oats, peas, and lentil seeds in this way bef... sowing. The effort though crude is very creditable.

A note appears in the *International Review of the Scien... and Practice of Agriculture* (February 1916) of a soil sampl... for soil bacteriologists. The sampler consists of a brass tub... 11 inches long, with one end made into a cutting edge. Thi... cutting edge is so made that the soil is not appreciably... compacted when the sample is taken. The end having the... cutting edge is furnished with a right fitting brass cap 2... inches in height. The open end, plugged with absorbent... cotton, makes the sample complete. In using the apparatus... the complete sampler is first sterilized. It is then taken to... the field, the cap is removed, the driving head is inserted... above the cotton plug, and the sampler is driven into the ground... to the desired depth. It is then pulled out, the cap is replaced... replaced, and the sample is ready to be taken to the laboratory... This sampler is easily sterilised, easily kept clean, easily... manipulated, and durable.



ORGANIC AGRICULTURAL CHEMISTRY. By J. S. Chamberlain, Ph.D., Professor of Organic and Agricultural Chemistry in the Massachusett Agricultural College. *New York: The Macmillan Company, 1916.*

While intended primarily for use in agricultural colleges, this book, treating of the chemistry of plants and animals, should be appreciated by all those interested in the higher branches of agricultural work. The arrangement of the subject-matter is new; no hard and fast line is drawn between the chemistry of plants and that of animals, and this enables the reader to grasp the fundamental inter-relationships that exist between these two classes of living organisms.

The first section deals systematically with the chemistry of the more important organic compounds found in plants and animals. Beginning with hydrocarbons, the principles of substitution and of isomerism are explained, the latter phenomenon being exhibited by two compounds of identical composition, such as the propyl iodides, which have distinctly different properties. The cyanides and amides are then discussed, followed by a section dealing with the simple alcohols. This is followed by information concerning the higher alcohols, and attention is called to glycerine as an alcohol possessing three hydroxyl groups.

Chapter III concerns the oxidation products of alcohol, namely aldehydes, and the fatty acids formed from these. A note is given on oxalic acid, which is a polybasic acid. The derivatives of alcohols and acids, namely esters, are then dealt with in a very clear and interesting manner. These esters are exactly analagous to metallic salts, the organic radicle taking the place of the metal. Thus instead of lead acetate we have ethyl acetate. Esters of the lower acids and lower alcohols are pleasant smelling, volatile liquids (hence the name ethereal salt). It is probable that the odour of fruits is due to the presence of esters. Some of these, like pine-apple essence, apricot essence, and pear essence have been produced synthetically.

Information is then given regarding waxes, fats and oils.

When an alcohol neutralizes an acid, thereby forming an ester, the process is termed esterification; and when in the decomposition of a compound the addition of water is involved, the process is known as hydrolysis. Hydrolysis and esterification are extremely important processes. In dealing further with fats and oils the different chemical and physical constants used for purposes of distinction are referred to.

In Chapter V dealing with mixed compounds, an interesting account is given of stereo-isomerism or space-isomerism, illustrated by the three forms of lactic acid, and this is used to lead up to the use of the polariscope. The theory of the asymmetrical carbon atom is then explained, and after dealing with malic and tartaric acids, this chapter concludes with a brief note on citric acid, which for students of tropical agricultural chemistry we consider inadequate owing to the importance of this compound.

Chapter VI deals in a very clear manner with the amino acids, proteins, urea, and uric acid. A list of the principal amino acids is given, and the physical classification of the proteins outlined. The subject of the hydrolytic decomposition of proteins is then dealt with to show the production of amino acids as cleavage products. An instructive section is devoted to the polypeptides, the study of which has thrown much light upon the composition of the proteins.

The study of uric acid leads to consideration of purine, and this in its turn brings us to a consideration of the composition of the active constituents of cacao, coffee and tea. Structural formulae are given for these substances, namely theobromine and caffein.

Chapter VII deals with the carbohydrates in the usual clear and scientific manner which characterizes this text-book. Various sugars and starches and celluloses are referred to, and the chapter concludes with a treatment of unsaturated compounds.

The next part of the book, Section 2, is physiological, and begins with a treatment of the subject of enzymes and enzymatic actions, thus striking at the outset a fundamental note in both plant and animal physiology. Even the general reader will read with interest the author's account of enzymic action, in which reference is made to the zymogens—mother substances from which enzymes are formed—and the co-enzymes and anti-enzymes which regulate enzymatic action. The chapter which follows deals in a general way with the composition of plants and animals, special attention being given to the general similarity between plant and animal cells. A straightforward account of animal food and nutrition, digestion and absorption follows in Chapter XI. Space is devoted to an account of hormones, which have received much attention from physiologists in recent years. The following chapter deals with animal metabolism, that is, the changes under which the food goes after it has been absorbed into the animal system. This chapter again is of general interest. On account of their agricultural importance, milk, blood and urine are specifically dealt with in a chapter to themselves.

Plant physiology begins in Chapter XIV, and the subject has reference principally to photosynthesis or the production of sugar in the green leaf through the agency of sunlight. Then follows information on fats and proteins leading to a statement of the nitrogen cycle.

The remaining portion of the book is more economic than the previous part. Space is given to a consideration of the occurrence and uses of important constitutents in agricultural plants. In this connexion tropical products are not overlooked. Interest from the tropical standpoint attaches to the information given regarding alkaloids, essential oils, terpenes, and tannins.

The last Chapter, No. XVII, concerns animal foods and feeding. Food values are discussed and their determination in calories explained. Information is given as to the energy and food requirements of man and animals.

It will be realized from the brief account that has been given of the contents of this book, that it covers a range of studies intimately associated with the successful production of plant products and their utilization for feeding and manufacturing purposes. Always a fascinating subject, organic chemistry in relation to agriculture, as treated in this book, will be found especially so even by those who have received but little previous training in the subject.

PLANT DISEASES.

A ROT OF HEVEA STEMS.

In Bulletin 25 of the Department of Agriculture, Federated Malay States, Mr. A. Sharples, Mycologist to the Department, gives an account of a disease of *Hevea brasiliensis*, due to the fungus *Ustulina zonata*, Sacc. The discussion of its methods of attack has considerable general interest in connexion with the care of trees in the tropics.

The fungus has attained prominence during the last two years as the cause of a disease affecting mostly rubber trees over ten years old. The fungus is commonly found working on the collar, where it causes a typical dry rot, not as a rule extending far up the stem. The diseased wood on exposure is found to be dry and tindery like touchwood, in advanced cases falling to pieces under the pressure of the fingers.

The disease is found on old plantations in every part of the peninsula; the fungus does not favour any special soil conditions as does the Fomes which is the cause of the root disease previously most familiar in the country.

The fungus is not confined in its attacks to the roots or collar, and the observations in the bulletin under notice refer mainly to its presence in the stem. It appears to be strictly a wound parasite, and Sharples traces back the causation of the present epidemics in plantations over ten years old to the thinning out of trees originally closely planted In this operation bruises on the bark of the standing trees from contact with the branches of those which are being felled can hardly be avoided. Another type of predisposing injury is scorching of the bark caused by leaf fires. Into such wounds boring beetles (Xyleborus) enter and set up a condition which leads to infection by the fungus under consideration. The laticiferous layer, contrary to the opinion of some previous investigators, is said to afford little protection against borer once the outer layer of cork has been injured. The penetration of the fungus is assisted considerably by the insects, which bore the wood in all directions and carry the infection with them.

There is no lack of spores of Ustulina in the clearings. The fungus is one of the principal forms occupied in the destruction of Hevea stumps and logs left in the plantations after thinning out; so that it is much more abundant after this process than before.

The general occurrence of this disease is held to justify a much increased expenditure on the removal of stumps from young clearings. In the case of stumps too large to be taken out, the author advocates separation of the main roots where they reach to a position some 2 feet below the surface. This with a view to preventing fungi spreading along the roots. A similar measure, the digging of a trench round a big stump, has sometimes been adopted in the West Indies against Rosellinia disease, but has usually been undertaken too late.

If thorough clearing has not been carried out before, a strong recommendation is made that it should be attended to at the critical period of thinning.

With reference to the development of this and other diseases as the plantations age, it is pointed out that 'rubber planting conditions with regard to disease may be totally different ten years hence from what they have been up to date Hevea has been remarkably free from serious diseases, but it appears possible that the troubles indicated are cumulative, and the future cannot be left to look after itself.' For estates undertaking energetic measures of sanitation the future is held to be assured, and at a cost 'absurdly small,' in comparison with the capital value of the clearings.

W.N.

THE ACCRA CACAO OUTPUT FOR 1915

The increase in the cacao exports from the Gold Coast Colony during 1915, as compared with those of the previous year, viz., 24,390 tons, or 46 per cent. in quantity, and £1,457,592, or 66 per cent. in value is due principally, so far as the increase in quantity is concerned, to the fact that new areas came into bearing during last year. No part of the increase can be said to be due to the large proportion of the 1914-15 crop that was exported in 1915, as quite as much of the 1915-16 crop will be exported in 1916.

The Accra exports accounted for 14,199 tons, or 58 per cent. of this increase. This was due partly to the extension of the railway and the consequent diversion to Accra of some of the crop that formerly used to go to Addah for shipment, but a large portion of it too, was due to new areas coming into bearing. Some of the cacao that formerly went to Winnebah was attracted to Accra by the keener competition there among buyers and the consequent higher prices, and some of the crop that formerly went to Coomassie is said to have been similarly attracted to Accra by the extension of the railway to Koforidua. Seccondee accounted for only 9,983 tons, or 24 per cent. of the increase. This was due partly to new areas coming into bearing and partly to the increased yield of the trees. Winnebah and Cape Coast showed but small increases in their exports.

At the beginning of the year it was feared that the shortage of tonnage calling at the ports of the Colony would have a very bad effect on the local cacao market, but as the result of representations made by the Government, the shipping companies made such arrangements that, although delays in obtaining ships were not infrequent, yet the whole cacao output was shipped, or was being exported, with little or no loss to anybody when the year closed.

Prices, with trifling fluctuations at times showed an upward tendency throughout last year At the beginning of January (1915) the local price was as low as 11*s.* per load of 60 lb., but by the end of that month it had risen to 14*s.* 6*d.* to 16*s.* 6*d.* At the end of April it stood at 30*s.* to 33*s.* which price continued, with some fluctuations, up to November, when it fell to 25*s.* to 30*s.*, and this was maintained to the end of the year. In reference to this, it is interesting to note that whilst the average f.o.b. value of the 1914 exports works out at £41 48 per ton, the corresponding figure for 1915 was £47·25 per ton. This is due solely to the market fluctuations and in no way to any improvement in the quality. Meanwhile, the relative value of Gold Coast cacao in the Home markets, according to the Comptroller, does not give much reason for jubilation. At the end of 1913 it sold at 56*s.* per cwt. as compared with 70*s.* for Trinidad, 62*s.* for Grenada, 85*s.* for Ceylon, and 66*s.* for Ecuador. At the end of 1915 the market reports show that the Gold Coast rates in the Home market were 67*s.* 6*d.* to 83*s.*, as against 92*s.* to 96*s.* for Trinidad, 85*s.* to 95*s.* for Bahia, and 92*s.* 6*d.* to 94*s.* 6*d.* for Guayaquil. For all Mr. Archer's disappointment, it is generally agreed, however, that whilst the increase in the output of cacao from the Gold Coast is one of the wonders of the cacao world the price it has all along sold at and is still realizing leaves very little to be ashamed of. (*Tropical Life.*)

THE SALISBURY BACON FACTORY.

In a previous issue of the *Agricultural News* (Vol. XIV, p. 118), the working of this bacon factory of Rhodesia will be found described, together with certain suggestions concerning the establishment of a similar factory in the West Indies. In the *West Indian Bulletin* (Vol. XV, pp. 207-11) the Hitchin Bacon Factory at Bedford in England is described, and those interested in the matter of these factories will find a comparison of the information presented in the two references of value.

The Salisbury bacon factory, which has recently been given further attention in the *Rhodesia Agricultural Journal* for June 1916, was originally intended to handle twenty-five pigs a week, but at the present time an average of seventy pigs is killed weekly, which, it is understood, has been made possible by the addition of an extra drying room.

Certain features of this factory not mentioned in the previous reference, are well worth calling special attention to. A special spur from the main railway line runs into the factory yard, by which means the pigs are delivered direct from the station of dispatch without any second handling. This reduces to a minimum the loss incident to the transport of animals by rail, and ensures their being received in a condition almost as good as when they left home. The conveyance of the pigs in the factory itself is done in an efficient manner, and care is taken to save the blood and other by-products; but the method of killing the animals by sticking appears to be somewhat crude compared with the use of the captive bolt pistol employed in the Hitchin Bacon Factory in England. Sticking is cheaper, perhaps, but less humane, and certainly a more unpleasant process for the operator.

After the cleaned carcase is skinned and weighed, it is placed in the chilling room to prevent the cooling off of the carcase from being too rapid. After a period in the chilling room, the carcase is cut up and shaped into bacon and ham.

From the article under consideration it would seem that the system of feeding, and the quality of pig handled in Rhodesia are very satisfactory. No particular breed seems to be noticeably better suited for Rhodesia than another; any of the standard English breeds, if looked after properly, give good results. It is the half bred Kaffir pig that appears to be disappointing.

As regards feeding, it has been found that for firmness of flesh and all-round good quality, nothing surpasses the pigs that have been fed on a mixed diet which includes a good supply of milk. Where milk is not available, the same results can be obtained by using a generous ration of alfalfa. A feed consisting almost wholly of meal and lucerne has produced excellent bacon. On farms where neither milk nor lucerne is obtainable, first class pigs have been raised when boiled roots have been fed, and mealie is mixed with the boiled mess. Good results follow from making the ration as mixed as possible, by the use of peas, dhal, beans, sweet potato tops, and buckwheat.

DESTRUCTION OF FOOD PLANTS OF THE COTTON STAINER IN ST. VINCENT.

Some general remarks in connexion with this campaign will be found in the Notes and Comments page of the present issue. In the following article the details forwarded by Mr. Sands in connexion with the work so far achieved are placed on record.

On July 26, the Assistant Agricultural Superintendent started to destroy John Bull trees (*Thespesia populnia*) at Edinboro, the services of a prison gang being placed at his disposal. It was found that the insect could be readily collected on heaps of the fruits of the John Bull tree and then burned. At this place all the John Bull trees, some hundreds in number, have been destroyed, as well as several large silk cotton trees. At the end of the month the gang reached Kingston valley. On July 31 Mr. Sands left for the windward district to start work there and obtained the voluntary assistance of several planters to act as Inspectors under the Ordinance. On his way to Georgetown, Mr. Sands instructed the Cotton Inspector to commence operations in the Biabou district. He started work at once and stayed with the labour gangs throughout the period. Arrangements were also made for the Georgetown district to be cleared.

In the country, all the estates have been cleared by their owners. The scheme has planned out well as each district has been dealt with under the direction of an Inspector and the whole area has been effectually cleared. Some idea of the work accomplished in the district from Stubbs to Colonarie can be obtained from the following records: at Stubbs 101 large John Bull trees, 1,649 saplings and one silk cotton tree were destroyed; at Biabou and Bridgetown 1,566 large John Bull trees and numerous saplings, at New Ground, Lowmans and Chapmans 2,584 large John Bull trees and numerous saplings; at Union, 962; at Colonarie, Mount Grennan, Sans Souci, Gorse, 600 were destroyed. The greater part of the windward district therefore has been cleared.

On August 16 the campaign was started in the Leeward district. On this day the inspector started with his gangs of axemen at Lowmans. All the silk cotton trees here were cut down and the work was continued through the district systematically dealing with trees at Rylands village and elsewhere to Buccament valley. Seventy-seven large trees and several small ones were felled during the period under review. Mr. Sands says that he finds there are a far larger number of silk cotton trees in the Leeward district than he had expected, so that the necessity for starting the felling operations at the present time is evident.

The cost of labour has been found to be very reasonable in view of the large amount of work that has been accomplished to date.

During the early part of the third week in August, a cyclonic disturbance was reported by the Havana weather bureau as having formed to the south of the island of Santo-Domingo, then having taken a direction that would carry it across Jamaica, and possibly make it touch Cuba. Fortunately its touch here was light, for while it did result in a few hours of rather high wind and rains over most of the island, the only damage that was reported was the carrying down of some of the telephone and telegraph wires in Pinar del Rio Province. No damage of consequence was done to to any of the cane, either by the wind or the rain, and the present outlook is for a continuance of weather that will be favourable to the growing crop. (*Louisiana Planter*).

MARKET REPORTS.

London.—The West India Committee Circular, August 10, 1916.

Arrowroot—No quotations.
Balata—Sheet, no quotations; block, no quotations.
Beeswax—No quotations.
Cacao—Trinidad, 53/-; Grenada, 68/- to 81/6; Jamaica, 73/-.
Coffee—Jamaica, no quotations.
Copra—No quotations.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/- to 3/6; concentrated, £23; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—No quotations.
Rubber—Para, fine hard, no quotations; fine soft, no quotations; Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 26, 1916.

Cacao—Caracas, 16½c. to 16¾c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 14¼c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $43·00 to $45·00; culls, $28·00 to $30·00.
Coffee—Jamaica, 9½c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 60c.; Antigua and Barbados, 58c. to 60c.; St. Thomas and St. Kitts, 56c. to 58c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$10·00 to $12·00.
Mace—40c. to 52c. per lb.
Nutmegs—22c. to 28c.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—5⅛c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·14c;. to 6·39c. Muscovados, 89°, 5·40c. to 5·74c; Molasses, 89°, 5·37c. to 5·62c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 2, 1916

Cacao—Venezuelan, $16·25 to $16·40; Trinidad, $16·00 to $16·50.
Coco-nut Oil—$1·23 per Imperial gallon.
Coffee—Venezuelan, 13c. to 14c.
Copra—$5·50 per 100 lb.
Dhal—$7·00 to $7·25.
Onions—$3·50 per 100 lb.
Peas, Split—$11·50 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $7·50 to $7·75; White, $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., September 6, 1916; T. S. Garraway & Co., September 5, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·00 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $5·00.
Peas, Split—$9·65 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $5·25.
Rice—Ballam, $7·55 to $7·75; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, August 31, 1916; Messrs. Sandbach, Parker & Co., June 30, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	5c. per lb.
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	19c. per lb.
Cassava—	——	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c.
Liberian	——	11c. per lb.
Dhal—	$7·00 to $7·25	$7·50 to $7·75
Green Dhal	——	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	2½c.	$9·00 to $10·00
Madeira	4c.	——
Peas—Split	$12·00 to $12·50	$12·00 to 13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·80 to $5·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·40	——
Rice—Ballam	$7·00 to $7·25	——
Creole	——	$6·75 to $7·00
Tannias—	$1·44	——
Yams—White	$2·64	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $4·60	$4·50 to $4·00
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The House-Fly in Relation to the Pen Manure Heap.

PERIODICALS recently come to hand containing several instances important information relating to the house-fly problem. Some of this has already been noted in the *Agricultural News* (see last issue, p. 314). The whole subject, however, seems to have a sufficiently important agricultural aspect to justify a more general and lengthy treatment

At the outset one may justly emphasize the fact that agriculture, or rather the maintaining of live stock, is responsible almost entirely for plagues of flies. If manure, in which flies breed, were rigorously destroyed there would be but few flies. Being indispensable for the maintenance of soil fertility, manure far from being destroyed must be conserved, and so one is forced to attack the problem in other directions. It is the duty of planters, and all those who keep animals, either in the town or country, for business or for pleasure, carefully to consider what ways and means of control there are.

In the first place it should be mentioned that recent work tends to show that the house-fly breeds in manure or refuse heaps near to dwellings to a far greater extent than in manure heaps in the open country, for the flies are attracted to the dwellings in search of food. The methods of control in relation to the pen manure heap, therefore, which are described below are more particularly important under domestic conditions rather than under those purely agricultural. On the other hand, pen manure under field conditions breeds large numbers of stable flies, *Stomoxys calcitrans*, which are dangerous both to equines and to man. The problem of controlling the breeding of flies in manure is, therefore, a very general one.

In regard to methods of control, recent work in South Africa* has indicated the practical value of poison bait. The bait employed consisted of 1 lb. arsenite of soda, and 2 gallons of molasses in 10 gallons of water. Its exposure in open receptacles was not found desirable on account of danger to children and animals. A safer method was devised based upon the well-known fact that when branches are removed from certain trees that have firm foliage, the leaves, although they wither, remain flat, fairly smooth and do not drop easily. Such branches were used as 'carriers

*C. W. Mally, M.Sc., in the *South African Journal of Science*, June 1915.

(certain *Acacia* spp. were found to be suitable trees) and on these the arsenite of soda bait was exposed in strategic situations, i.e. over manure heaps or other breeding places, in and around buildings or anywhere where flies tend to congregate.

Experiments conducted at various centres gave very satisfactory results. Reduction in the number of flies was apparent at the start. This method of fly destruction indeed proved to be so successful that it has been systematically taken up by the municipal authorities in Capetown and by the South African Army Medical Corps authorities.

The important principle to bear in mind is the idea of attracting the flies to their breeding places and killing them there before they gain entrance into the house. Thus the duty of fly destruction falls upon those who are responsible for the accumulation of manure or refuse, and not upon the householder who at present wages a more or less ineffective campaign indoors with fly-paper and similar contrivances.

In connexion with the manure heap, there is still another method that might be followed. Reference to the last issue of the *Agricultural News* (p. 314) will show that it has been found possible to destroy the larvae of the domestic fly by merely turning the inner parts of the pile over the fresh manure which contains larvae. The heat generated by the manure, as well as the gases which are formed during fermentation are very fatal to the larvae when they are exposed to them. The simplicity of this method of control renders it of considerable practical importance, and it should be employed in conjunction with the use of the poison bait described above.

Several observations of interest have been made concerning fly breeding and manure constituents. In South Africa it was noticed that numerous flies apparently feed on certain specks on the straw and coarse litter in the manure. On close observation it was found that the surface of this straw was sufficiently smooth and hard to serve as a bait-carrier. It was therefore decided to vary the method described above and sprinkle the bait lightly over the manure itself. This was accompanied by satisfactory results, but it was not found advisable to dispense with the leaf carriers.

Other observations have been made in Paris* with the object of determining the constituents of horse manure favourable to the deposition of eggs. Eggs do not appear to be deposited in the unmixed dung and urine-soaked litter of cattle, goats and pigs. These excreta, however, may become suitable material for the development of flies after the addition of such a secondary fermenting substance as wheat bran. Mixing cow and horse excreta, and feeding wheat bran to animals render the resulting manure liable to infestation by larvae.

The foregoing information embraces the principal facts known regarding the control of fly breeding in the refuse and manure heap. We may now say a few words in connexion with the sanitary side of the question of fly control with a view of emphasizing its importance. Reference to the house-fly merely as a nuisance is inadequate, for, the domestic fly, like the mosquito, is more than a nuisance—it is a source of danger for it carries the germs of disease. The dissemination of typhoid is largely attributed to flies, and in this connexion it is important to prevent flies obtaining access to milk, which forms an excellent culture medium for most pathogenic organisms. Flies, therefore, are particularly dangerous in the vicinity of dairy cows, and under these conditions the employment of the poison bait method of control should be systematic. Another disease the transmittal of which is credited to the house-fly, is infantile paralysis. In this disease the patient exhibits a discharge from the mucous membrane of the nose and flies, if not screened, tend to settle and then disperse with the infection to another person who may be healthy. In New York this is believed to be the principal form of dissemination during the epidemics of infantile paralysis that sometimes occur in that city.

Besides the house-fly, the manure heap breeds, as already stated, the dangerous stable fly, *Stomoxys calcitrans*, which carries the fatal equine disease 'Mal de Caderas'. This disease broke out a year or two ago in British Guiana: it is common throughout South America. This affords additional evidence of the obligation of the agriculturist and stock breeder in the matter of controlling flies along the lines laid down in this article. It should be remembered finally that flies are able to travel quite long distances: the dispersion of marked flies over an area of from 5 to more than 12 square miles has been observed. Thus the manure heap is not only a source of danger and annoyance to the immediate neighbourhood but to a much larger territory as indicated by the observation just quoted.

*E. Rouband, *International Review of the Science and Practice of Agriculture*, Year VII, No. 2, p. 188.

THE GROWTH OF THE SUGAR-CANE.

On several occasions attention has been called in this Journal to the desirability of greater observation work in connexion with the growth and development of the sugar-cane. The work required should have regard to measurable characters, as, for instance, relative root growth under different soil conditions and with different varieties. Records would also be useful concerning the rate of growth of the stem under different conditions and the rate of leaf development. The cane plant on account of its habit of growth affords good material for making such observations, and it should be easy to establish correlations which might be useful in selection work.

The *Louisiana Planter* (for September 2) gives this idea consideration editorially, and some of the remarks made on the subject are reproduced below:–

Under the most favourable circumstances of sugar-cane growth such as frequently characterize the growing seasons in Louisiana in July and August, when there is ample sunshine and rainfall, the growth of sugar-cane in the height of the rounded part of the stalk sometimes reaches two or three joints per week. The joints grown under such favourable conditions are generally of good diameter, say from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches and of good length, say from 4 to 6 inches, and are apparently much finer canes than are generally grown in the tropics where, while the yields in total weight may be larger, the canes are frequently slender and short-jointed. We believe that Louisiana has developed as fine or finer cane culture than practised elsewhere in the cane-sugar world. The fact of the matter is that in the tropics cane grows with such freedom that the planters become somewhat indifferent to its condition and any bad work may perhaps be redeemed by supplying new plantings where the planted cane has died out. This has led to some indifference as to cultivation on the part of the tropical sugar planters so long as they secure adequate supplies of sugar-cane for their great central factories.

We do not now recall any sugar-cane experiment station work wherein the progress of the growth per day or week or month has been recorded, and it would seem to afford an excellent opportunity for some research work in that direction. By its means the growth of sugar-cane per week could be identified with the rainfall in the same locality per week and the whole season of active growth, thus coming under careful observation, we might find that certain varieties of cane grew more rapidly under given conditions than other canes, all of which would gradually lead to the utilization of the most successful and doubtless the best types of cane for our various soils and conditions. Sugar planters have at times marked a given point on the growing end of the sugar-cane by tying a string around it and by driving a stake alongside the cane of the same height as the mark. This would give the growth per day or per week, or per month of the single instance under observation. If the work were carried on more extensively we would likely find the greatest growth of the cane in the periods of the greatest amount of sunshine and that cloudy days would give less active growth. It is on this account that the Hawaiians claim that their irrigated plantations, where they have no rainfall whatever and presumably but few clouds, and do have almost constant sunshine, give more profitable returns than those plantations in Hawaii where there is nearly if not a full supply of rainfall sufficient for the growth of the cane crop.

A writer discussing this matter some months ago, stated that by inserting a needle horizontally in the growing part of the cane, by which he means what we call the bud or soft, top joint of the cane, holes are made through all the leaves, sheaths and internodes, which will serve as points from which to measure the growth of the various parts with respect to the outer sheath, which has ceased to grow.

In order to examine into these results the leaves are removed one by one and the displacements of the holes in the different parts of the stalk can be measured with respect to the small hole formed by the needle in the outer sheath.

Observations indicate that the elongation of the sheath occurs later than the growth of the leaf; that the internode at the extremity of which the leaf grows, begins to elongate when the growth of the entire leaf is almost finished. There seems to be a growth at the base of this internode which has not yet reached its maximum growth when the upper portions have already reached theirs. These determinations are made by the measurements hereinabove referred to and it would seem likely that much valuable data could be secured by such research work in our experiment stations.

NOTES ON THE SUGAR INDUSTRY OF CUBA.

The following facts concerning the cost of production of sugar in Cuba are taken from an article in the *International Sugar Journal*. It is possible that in the future the price of cane sugar will be determined largely by the cost of production in Cuba; hence information on the subject is of more than passing interest.

Most of the cane in Cuba is bought by the factory on a sliding scale dependent on the current price of sugar. With cane at 5 per cent., and sugar at 3c., the cost of a ton of cane is $3, f.o.b. cars. In regard to the cultivation expenses in western Cuba, it is stated that the cost of a ton of cane f.o.b. railway cars in western Cuba works out on an average at something like $2·13 per ton.

The value of land in Cuba varies according to the situation and fertility; in eastern Cuba, where there remain the most extensive tracts of new land, the price starts at about $5 per acre and may reach $25 under special conditions.

Concerning harvesting expenses, it is stated that the price paid for cutting and loading into bullock carts is about 60c. per ton; the hauling to the railway siding costs, on an average, 45c. per ton, including the transfer to the railway waggon.

The cost of manufacturing sugar varies with the size of the factory, its efficiency, and with the percentage of sugar in the cane; it lies all the way from $6 to $12 per ton, the former figure referring to the larger factories when the yield is high and the latter under adverse circumstances of small output and small yield.

As regards cost of factory, it is said that the rough rule for the establishment of a central, applicable to normal times, is to allow $15 per bag capacity, to include factory, land, houses, oxen, railway system, carts, etc., but not including the establishment of the crop.

On examination of the above data it will be seen that Cuba is essentially a country of extensive, as opposed to intensive work in both field and factory; an analysis of the cost of production shows that the harvesting expenses form the largest individual item and demonstrate the advantage Cuba possesses in its proximity to the United States market; and finally, reveals that the cheapness of production is largely due to the absence of any expense or intensification.

FRUIT CULTURE.

CALIFORNIA GRAPE FRUIT AND ITS FUTURE.

On account of the poor reputation of California grape fruit as a whole, which has led many people to doubt the advisability of extending the culture of this crop in California, Mr. A. D. Shamel, of the United States Department of Agriculture contributes to the *Monthly Bulletin of the California State Commission of Horticulture*, a useful discussion and review of the present position, the main features of which will prove of interest to citrus growers in the West Indies.

The early plantings of grape fruit in California were of Florida varieties which were selected without much knowledge of their adaptability to California conditions. It is only in recent years that any real knowledge has been developed of the comparative value of several varieties for that State. Of the varieties fruited so far, one, the Marsh Seedless, stands out clearly as particularly adapted for California conditions and is of genuine commercial value. It is becoming more and more evident that the grape fruit tree planted on rather light, porous and sandy soils produces fruit of superior commercial quality, colour, and texture of rind to those planted on the heavier clay soils. That there is a relation between the character of the soil and the commercial quality of the fruit can hardly be doubted.

As regards the marketing of the fruit, it is said that an early variety is needed, producing fruit which will ripen from October until February for California markets, and this is one of the achievements worthy of the serious attention of citrus breeders and propagators. Under proper conditions, the late grape fruit can usually be held in storage for some time with constantly improving flavour and little loss of weight from shrinkage. These conditions are, first, a uniform, cool temperature; and, second, a uniform condition of humidity of about 90 per cent.

Proceeding next to a discussion as to the correct name of the fruit, reference is made to the American name of pomolo which was given to this fruit. The author agrees that grape fruit, being more commonly used than pomolo and better established in the public mind is now a more logical one than pomolo. Reference is made to the fact that Swingle regards grape fruit as *Citrus grandis*.

After describing the different varieties, in which reference is again made to the Marsh Seedless, the writer proceeds to deal with the subject of the distribution of plantings. In 1915, 600 acres of grape fruit trees were in bearing in California and 1,100 additional acres of trees were under five years of age, from which it is estimated the California output will be more than doubled in the coming five years. The area under cultivation in Florida is very much greater, something like 60,000 acres, while large areas also exist in Porto Rico and Cuba, both of which places make large shipments to the States annually. A comparatively small but rapidly increasing export of grape fruit to the United States from Jamaica and some other foreign grape fruit growing sections is evident from the observations and figures available for study.

In considering the grape fruit situation in California, it has to be borne in mind that Florida or foreign grape fruit is no longer admitted into California on account of the danger of the introduction of insect pests and fungus diseases through this means. Second, the period of ripening of the Californian Marsh Seedless grape fruit is during the summer months when no other known district has a ripe crop available to supply the great Eastern markets. For these and other reasons, it is believed that California has an opportunity to develop a strong grape fruit industry provided only the best possible grades of grape fruit are produced and provided the fruit is allowed to ripen before picking.

The relation of composition and other characteristics to quality of grape fruit has been investigated by the Bureau of Chemistry of the United States Department of Agriculture through the laboratory of by-products, located in Los Angeles. The figures published in the present article show clearly the difference in acid and sugar content between California and Florida grape fruit. There is considerably more acid (about 2·3 per cent.) in the California fruit than in the Florida which has approximately 1·5 per cent. The sugar in the Florida fruit is also greater (nearly 8 per cent.) than in the California fruit (7 per cent.).

In the succeeding section reference is made to variability of the Marsh Seedless varieties. Some trees have been found to produce habitually fruits containing large numbers of seeds. In some cases this heavily seeded characteristic was found to be correlated with a rough, thick rind and an undesirable shape of fruit. It is said that this type has since been proved to have originated from bud mutations. It has been unintentionally propagated through the absence of any careful system of bud selection based on individual tree performance records. It is important that the standard and valuable type of Marsh Seedless should be isolated in propagation by bud selection based on individual tree performance records.

The writer in conclusion makes a few remarks in regard to the pruning of grape fruit trees, which may be of interest to readers in the West Indies:—

'The principle of pruning grape fruit trees is not fully settled. So far as the writer's observations have gone, the best method of pruning for young trees is to lay the foundation for strong tops by careful heading, not allowing all of the main branches to arise at one point, and by some careful thinning of the new growth from time to time. It is probably a good plan to cut out most of the distinctly marked sucker growth and when necessary to remove the dead branches. When the period of maximum production begins to wane, it now seems probable that it may be best to cut off the old tops and grow new ones; in other words, renew the trees. If the type of tree and fruit is not exactly desirable, the time of tree renewal is the proper period for topworking by rebudding, so that the new tops will be produced from buds instead of from sprouts.'

DEPARTMENT NEWS.

Dr. J. C. Hutson, B.A., Ph.D., at present Assistant Entomologist, Estacion Experimental Agronomica, Santiago de las Vegas, Cuba, has accepted the offer to act as *locum tenens* at this Office during the absence in Egypt of Mr. H. A. Ballou, M.Sc., Entomologist on the staff of this Department. At the time of writing Dr. Hutson was working in the eastern part of Cuba in co-operation with the Comison de Sanidad Vegetal, on the problem of the Spiny Black Fly on Citrus, a pest that is at present engaging attention in Jamaica.

Dr. Hutson is expected to arrive in Barbados early in November.

THE GRASSES OF DOMINICA AND ST. LUCIA.

DOMINICA.

In the progress report of the Department for 1913-14, a list was given of the Dominica grasses collected during the year. Inadvertently the names of the authorities were omitted. During the last two years, nine additional species were collected, and those not known locally were determined by Mr. Hitchcock, of the United States Department of Agriculture, and the full list is now reproduced. Following the list of grasses appears a list of some species of sedges which were also forwarded to Mr. Hitchcock, and named by Mr. P. B. Stanley:—

Andropogon brevifolius, Sw.
„ condensatus, H.B.K.
„ pertusus, Willd.
Anthephora hermaphrodita, (L) Ktze.
Arundinella martinicensis, Trin.
Axonopus compressus, Beauv.
Bouteloua americana, Scribn.
Capriola dactylon, (L) Ktze.
Cenchrus viridis, Spr.
Chaetochloa glauca, (L) Scribn.
Chloris paraguayensis, Steud.
„ radiata, (L) Sw.
Coix lachryma, Linn.
Cymbopogon citratus, Stapf.
„ Nardus, Rendle.
„ Schoenanthus, Spreng.
Dactyloctenium ægyptium, (L) Richt.
Echinochloa colonum, (L) Link.
Eleusine indica, (L) Gaertn.
Eragrostis ciliaris (L) Link.
„ delicatula, Trin.
„ tephrosanthes, (Spreng.) Schult.
Erichloa punctata, (L) W. Hamilt.
Isachne disperma, (Lam.) Doell.
Ischaemum latifolium (Spreng.) Kunth.
Lasiacis, n. sp., (Previously Panicum divaricatum).
Leptochloa virgata, (L) Beauv.
Melinis minutiflora, Beauv.
Oplismenus hirtellus, (L) R. & S.
„ loliaceus, Beauv.
Panicum (chaetochloa) barbatum, Lam.
„ barbinode, Trin.
„ laxum, Sw.
„ maximum, Jacq.
„ palmifolium, Willd.
„ pilosum, Sw.
„ trichoides, Sw.
Paspalum conjugatum, Berg.
„ fimbriatum, H. B. K.
„ Helleri, Nash.
„ paniculatum, L.
„ pumilum, Mecs.
Pennisetum setosum, Rich.
Setaria brachiata, (Poir.) Kth.
Sporobolus jacquemontii, Kth.
Stenotaphrum secundatum, (Walt.) Ktze.
Thysanolaena agrostis, Roxb.
Syntherisma digitata, (L) Hitche.
Valota insularis, (L) Chase
Vetiveria zizanioides, (L) Nash (Andropogon squarrosus, L f).

The following species of sedges have been determined:—

Cyperus compressus, L.
„ filiculmis, Vahl.
Fimbristylis polymorpa, Boeche.
„ autumnalis, R. & S. ?
Kyllinga pumila, Michx.
Rynchospora polyphylla, Vahl.
Scleria melaleuca, Schlecht, & Chamis.

ST. LUCIA.

The investigation of the native and naturalized grasses of St. Lucia, commenced in 1913 and referred to in the last Annual Report of the Agricultural Department (1914-15) was carried a stage further during the year 1916.

Nineteen specimens were collected and forwarded to Mr. A. S. Hitchcock, Systematic Agrostologist of the United States Department of Agriculture, for determination. Thirteen of these specimens proved to be new records.

The thanks of this Department are due to Miss Agnes Chase, Scientific Assistant in Systematic Agrostology, who in the absence of Mr. Hitchcock undertook the work of identification. These species proved to be:—

Andropogen condensum, H.B.K.
Anthephora hemaphrodita, (L.) Ktze.
Chloris paraguayensis, Steud.
Cyperus compressus, L.
„ surinamensis, Rottb.
„ rotundus, L.
Dactyloctenium ægyptium, (L.) Willd.
Echinochloa colonum, (L) Link.
Fimbristylis miliacea, Vahl.
„ diphylla, Vahl.
Leptochloa virgata, (L.) Beauv.
Paspalum virgatum, L.
Syntherisma digitata, (Sw.) Hitchc.

New Agricultural Instruction Work in Antigua.—A report on the starting of new work in regard to peasant instruction in Antigua has been received from Mr. T. Jackson, Curator of the Botanic Station. In the covering letter it is mentioned that in the Piccadilly District of Antigua there are approximately 120 peasants working land on areas ranging from $\frac{1}{4}$-acre to 7 acres so that at the present time there is a considerable amount of work to be done in this part of the island.

During August, with which period the report deals, the planting of cotton on the holdings visited was near completion. Advice was given in regard to matters of cultivation. An attempt was made to establish a better understanding amongst the peasants as to the advantages afforded by the Government Granary. Suggestions were also made concerning the cultivation of onions. From information obtained the reaping of provision crops was nearly finished in the district. Necessary advice was given in regard to the desirability of replanting as quickly as possible after the reaping of the crop. The pest known as Jacobs (Scarabee) was found to be very prevalent in sweet potatoes. The presence of this pest is believed to be due to the fact that fresh areas are continually being planted with infested cuttings. Healthy cuttings from the experiment station were offered to the holders.

The institution of the work referred to above is likely to prove of considerable value in the future to the peasants of Antigua.



COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 5, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report a fair business has been done in West Indian Sea Island cotton, and quotations are raised 1*d.* per lb. The sales comprise Anguilla 16½*d.* to 20*d.*, St. Martin 16½*d.*, St. Kitts 19½*d.* to 21*d.*, Nevis 16*d.* to 21*d.* and Barbados at 20*d.*, with a few stains at 12*d.* to 14*d.*

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 9, 1916, is as follows:—

This is the first report of the market we have issued since the closing of last year's report on August 1.

You will note the receipts in Savannah to date are 1,007 bales, exports 1,085 bales. The exports from Jacksonville are 1,583 bales, principally old crop cotton. The market opened for the first receipts on a basis of 28c, but almost immediately a very active demand sprang up and the market being very sensitive advanced to 32c, probably caused by a rush to cover short sales. The market then receded to 30c, and at this writing Fancy Georgias are selling at 31c in Savannah, Factors holding at 32c and even higher prices asked in the interior. We do not see immediate prospect of lower prices until the receipts are freer and the immediate demand is satisfied.

CROP REPORTS.

ISLANDS. The reports from the Islands of the growing crop are not at all promising and the injury from the storm of July 13 seems to have been greater than we estimated at the time. The injury is estimated generally to be 40 per cent. and some estimates are even greater than that. We ourselves think we will make 60 per cent. of a crop but cannot see how the crop can be more than that. Of course as the season advances and a late frost is assured, we may have to revise our estimate, but at this writing we would say the Island crop will be 60 per cent.

GEORGIAS AND FLORIDAS. The Georgia and Florida crop on the whole is promising. There have been some reports of boll weevil, but we do not attach much importance to them. Estimates of the crop range from 90,000 to 100,000 bales. As regards future prices we think there will be a very active demand for the entire crop, and we do not look for any lower prices. The demand seems to be very general on account of the Northern and Southern Mills. It would take a very large movement to cause any material reaction from present prices.

COTTON IN FIJI.

Cotton was the chief crop experimented with at the Lautoka Station, Fiji, during 1915, and that year completed the ninth one of cotton cultivation in the Colony. These experiments consist of efforts to demonstrate the suitability or otherwise of Fijian conditions for Sea Island cotton cultivation.

The various operations connected with the cultivation of the crop were carried out in the following order: September 1914, ploughing and harrowing; October 1914, cross ploughing and harrowing; November 1914, ridging and drilling; December 29, 1914 and January 8, 1915, planting, ploughing, thinning, weeding and scarifying; May, picking commenced; September 10, picking completed. The rainfall received during the year amounted to about 30 inches. As regards the yields obtained the black soil gave 239 lb. of cotton per acre and the red soil 238 lb. of cotton per acre. The evenness of these results is rather remarkable, the heavily manured red soil giving practically the same return as the untreated black soil.

The cost of growing the crop is shown in the following table:—

	Black soil. £ s. d.	Red soil. £ s. d.
Preparation of land	1 6 11	1 1 1
Manuring	0 2 4	0 19 0
Planting	0 8 3	0 8 11
Supplying, weeding, etc.	3 6 3	2 3 8
Picking	3 17 8	2 18 8
Total	9 1 5	7 11 4
Cost of growing 1 lb of lint	9·1*d.*	7·6*d.*
Cost of picking 1 lb. of seed cotton	1·06*d.*	·80*d.*

The kind of cotton cultivated was a strain obtained from St. Kitts, which has now replaced the Barbados strain originally cultivated. As regards cotton stainers, though these were prevalent during the latter part of the picking season, they were not plentiful. Some pods were lost as the results of the attacks

It is interesting to note that in Fiji, cotton selection by means of the progeny-row method is being carried on in order to ensure a satisfactory seed supply. In 1915 the selected plant, out of six, had lint of an average length of 1·60 inches, of fair strength, with 27·1 per cent. of lint in the seed cotton. This plant gave 1·08 lb. of seed cotton which at 27·1 represents ·29 lb. of lint. The seed from this plant was sown by itself in a special plot, the seed from which is used for the large plots the following season.

An interesting experiment has been conducted in Fiji which consists in growing cotton before bananas as organic manure. Cotton seed was sown at the rate of 6,720 lb. per acre and when the young plants had reached an average height of 9 to 10 inches they were ploughed under. The total weight of the bananas produced in the plot manured in this way was 454 lb. compared with 282 lb. in the case of the control. The cotton seed therefore seems to have had some effect.

GREEN DRESSING TRIALS IN DOMINICA.

Reference to the reports of the Dominica Agricultural Department will show that during the last few years a large number of plants have been tried at the Experiment Station, with the view of finding out those that are most likely to prove of value under Dominica conditions.

Below will be found a list of some of those experimented with:—

Horse bean (*Canavalia ensiformis*)
" *gladiata*
Tephrosia candida
" *Hookeriana*, var. *amœna*
" *Vogelii*
Indigofera suffruticosa
" *Anil*
Jerusalem pea (*Phaseolus trinervis*)
Chick pea (*Cicer arietinum*)
Cluster bean (*Cyamopsis Psoraloides*)
Bengal " (*Stizolobium aterrimum*)
Lyon " " *niveum*
Pigeon pea (*Cajanus indicus*)
Clitoria cajanifolia
Soy bean (*Glycine hispida*)
Rounceval pea (*Vigna unguiculata*)

With two or three exceptions the various species grew well, producing a large quantity of green material. Those that years of experience have shown to give the best results are:—

The Horse bean (*Canavalia ensiformis*)
Tephrosia candida
" *Hookeriana*, var. *amœna*
Bengal bean (*Stizolobium aterrimum*)
Pigeon pea (*Cajanus indicus*)

Canavalia ensiformis, the horse bean, is the best all-round cover that we have. The seed is large and germinates readily. Planted at the beginning of the wet season it keeps on growing for four to six months, covering the ground with a low (2 to 3 feet) undergrowth which keeps the soil free of weeds. The plants form a large number of root nodules, thus adding to the soil a very considerable quantity of nitrogen; and on decaying, the foliage forms valuable mulching material. They may be sown in rows 3 feet apart and about 6 inches apart in the row. They will require to be weeded once or twice. The plant is a weak climber.

Tephrosia candida has been under cultivation for several years and can be strongly recommended. The seeds, however, are very small and should be sown with the rains; the plants need careful nursing in the early stages; they must not be sown too deeply. Once established, they grow 6 to 7 feet high and keep the ground free of weeds for about two years.

Tephrosia Hookeriana, var. *amœna*, is similar to former, but grows to a height of 2 to 3 feet.

Stizolobium aterrimum, commonly known as the Bengal bean, whilst forming a dense growth and a large quantity of green manure, and keeping the ground clean for a lengthy period, cannot, owing to its strong vine-like growth, be grown amongst trees such as limes, cacao and coco-nuts, unless care is taken to keep the vines cut back from the trees at intervals. If this precaution be taken, then several species of Stizolobium could be employed for the production of mulch.

Cajanus indicus, the pigeon pea, is so well known that no description need be given of its cultivation and habit of growth.

In spite of the efforts which have been made by the Department, by example and in other ways, to popularize the growing of green dressings, it cannot be said that the practice has been taken up on estates to any considerable extent. With one or two exceptions, the growing of green dressings never enters into estate practice in Dominica. This is to be regretted, for it is recognized as being one of the chief methods of improving the condition of the soil. With the heavy rainfall and the action of the hot tropical sun, the decay of humus in the soil is rapid, and needs continuous replacing if the fertility of the soil is to be maintained and increased. Furthermore, the growing of green dressings would prevent to a large extent the wash of surface soil which is to be seen going on all over the island, and would also add materially to the nitrogen content of the soil.

On the other hand, established lime fields in Dominica are so covered in, that but very little vegetation will grow under the shade of the trees, and furthermore, even if they did, there would be the difficulty of picking up the lime crop. Under these circumstances, it is necessary to procure plant food from outside. Whether, under these conditions it would be remunerative to grow crops on waste land to be carried on to the fields at the right season, has not yet been demonstrated Efforts to solve this problem are being made at the Lime experiment station, where ravines and such places are planted up with lemon grass (*Cymbopogon citratus*) and the Nicaragua shade tree (*Gliricidia maculata*). Data as to the tonnage per acre obtainable from such places with these plants may be available in a year or two. There are acres of such land on most estates in Dominica which could be utilized for this purpose.

The above remarks on green dressings hold good, therefore, only in the case of young cultivation, and when the trees are widely planted and have not yet filled in.

Transformations in the Sweet Potato.—The following is a summary to a paper on this subject in the *Journal of Agricultural Research*, Vol. V, No. 13: From the data given in this paper it appears that in the carbohydrate transformations in stored sweet potatoes, starch is first converted to reducing sugars and cane sugar is synthesized from the reducing sugar. The rates of starch hydrolysis and of sugar synthesis in a general way conform to the Van't Hoff temperature rule for rates of chemical reactions. At high temperatures the reactions are rapid at first, but soon become slower and approach an end point. At low temperatures the rates are slower and the end point is so shifted as to permit a greater concentration of sugar. The reactions are continuous.

In the growing sweet potato the concentration of sugar remains comparatively low. The extensive conversion of starch into sugar appears to be inhibited by the activity of the vines. When the vines are destroyed and the flow of materials to the roots is thus interrupted, the carbohydrate transformations characteristic of stored sweet potatoes are begun, even if the roots are left in the ground.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the house-fly in relation to the pen manure heap, and suggests methods for the control of this pest.

Interesting facts concerning the sugar industry of Cuba will be found on pages 323 and 331.

An account of the present agricultural conditions in the Northern Grenadines will be found on page 334.

Interesting information concerning cotton in Fiji appears on page 326.

Agricultural Prospects in Montserrat.

In an address delivered in Montserrat on September 6, the Imperial Commissioner of Agriculture referred to the importance of still giving consideration to the increased production of provision crops in spite of the fact that the food situation is now comparatively secure compared with the position in that respect at the beginning of the war. Reference in particular was made to the cultivation of pigeon peas, a good trade in which has been established already in St. Vincent.

It was pointed out that the principal commodity now produced in Montserrat is cotton, the value of the exports of which are 50 per cent. of the total exports of the Colony. While it is a speculative crop there are signs that the market demand will continue good and steady. At the same time every care must be taken to maintain and increase the quality and uniformity of the lint produced. Good prices and good crops should not lead growers into a dangerous sense of security. The Commissioner referred to the excellent work on seed selection that was being conducted, year by year, at the Experiment Station, by Mr. W. Robson.

Since the war, increased attention has been given to the local sugar industry; old works are being put into order and a very fair amount of land is now under cultivation in this crop. The question that most urgently presses is the future price of sugar and what is likely to be the demand for the low grade sugar that can be made in Montserrat. The demands of Great Britain, it was thought, would be readily met by the increased production of many countries, particularly Cuba, South America, Java, Hawaii and the Philippines. It was thought that the price of sugar would be mainly determined by the cost of production in Cuba and to a lesser degree in Java, and to some extent perhaps, it would be regulated by fiscal considerations. In these circumstances the Commissioner thought that after the war sugar would steadily settle down to a moderate level, and this, at a very rough guess, he thought might be about £2 per ton or so above the former level of prices, that is to say, crystal sugar for refiners' use might sell at somewhere ranging around £12 per ton, and other grades such as muscovado as produced in Montserrat, in proportion.

In conclusion the Commissioner referred to the importance of maintaining interest in the minor industries of the Colony. Regarding the possible increase in the production of sugar, Montserrat should follow any developments that might take place in regard to overhead transport, some system of which was required in Montserrat in certain inaccessible districts. Finally in closing his address the Imperial Commissioner made reference to the need of planters appreciating the value of experimental and research work and for the need of the formation of sound public opinion in the community in order that agricultural interests might be advanced not merely for the welfare of the individual but for the good of the country.

Insects as a Source of Human Food.

Dr. L. O. Howard. Chief of the Bureau of Entomology of the United States Department of Agriculture, contributes a short note to the *Journal of Economic Entomology* for August 1916 on Lachnosterna larvae as a possible food supply, and states that these larvae have been made into salads and soups at the Department and found to be agreeable. Lachnosterna spp. are represented in the West Indies by the hardbacks, the grubs of which may at times do considerable damage to the roots of sugar-cane and corn. It would certainly be a distinct offset to the damage occasioned by the grubs if they could be collected and used as food.

Dr. Howard says, speaking generally, that there is rather an extensive literature concerning the edibility of insects and a complete bibliography is being prepared in the library of the Bureau.

As regards the trials with Lachnosterna referred to, the salad which was prepared was eaten by several men in the Bureau and was found to be very palatable. Another lot of grubs were dealt with in the same way as is employed in making oyster stew and the grubs were taken as well as the broth. It was considered to taste very much like boiled crab meat and not much different from lobster.

Concerning the edibility of insects in a general way, many species are very abundant under certain conditions, and if methods of collecting them and preparing them for food were well understood, it would mean much for many in moderate circumstances, and there is the possibility that studies along this line would not be without significance for the epicure. There is not only an opportunity to take advantage of the unusual numbers of insects which now occur under natural conditions or at least without intentional assistance from man, but the short life-cycle and the great prolificacy of certain insects suggests the possibility of using some forms as an agent in rapidly transforming comparatively worthless materials into a food possessing not only nutritious, but appetizing qualities. In other words, there are possibilities in rearing insects for food as well as for the production of honey, dyes or silk, deserving careful attention.

Agricultural Returns in England and Wales.

A very interesting memorandum has been received from the English Board of Agriculture which consists of a statement of the area of land under different crops, and the number of stock maintained at June 1916 when the returns were collected. The figures show an increase of 20,760 acres in a total area under crops and grass in England and Wales. In arable land there was an increase of 85,190 acres, largely in the place of permanent grass, which shows a decline of 64,430 acres. These changes are significant in regard to the demand for produce in connexion with the conduct of the war.

As was expected after the very large increase last year, the area under wheat shows a reduction, the total area, 1,912,000 acres, being a quarter of a million acres less than in 1915. The total is, however, much greater than in recent normal years, and (except for 1915) is the highest since 1889. This sudden fall in wheat area is significant in regard to the recent high prices for this commodity. The memorandum goes on to say that barley shows a recovery of 100,000 acres from the low record of 1915; but oats show scarcely any change. Beans and peas show considerable reductions, the area under these two pulse crops being about seven-eighths of that returned in 1915. Potatoes and mangolds have both fallen off by some 35,000 acres, but turnips and swedes increased slightly. Among minor crops the chief alteration is in the acreage of mustard (whether for seed or fodder) which is more than double that of 1915. Although the area under permanent grass shows a decline, that portion reserved for hay shows a large increase, viz., of 175,000 acres; clovers and rotation grasses show an even greater increase, the total under this crop being 228,000 acres more than last year. Taking all categories of clover and grass, the increase in the area for mowing, as compared with 1915, is 400,000 acres.

All classes of horses show an increase, the total being over 72,000 more than in 1915; the greatest relative change is in the young stock under one year of age. Cattle show a rise of over 151,000, and the total number is the largest ever recorded in England and Wales. The increase is chiefly among the heifers in calf and the fattening cattle; cows in milk show a small decrease. All categories of sheep are more numerous than last year, the augmentation being 429,000. Pigs, on the other hand, show a drop of about 10 per cent., and are practically at the level of 1913.

The Cultivation of Cacao.

In referring to the remarks made by the Imperial Commissioner of Agriculture in an address before the Agricultural and Commercial Society of Grenada, the Journal of the Jamaica Agricultural Society fully agrees that 10 bags per acre should not be considered an exceptional yield of cacao. That journal agrees with Dr. Watts that 1,000 lb. or 1,200 lb. per acre are more frequently obtained on good estates. The journal above goes on to say that a yield of 1,200 lb. would bring about £30 per acre. The average yield in Jamaica is, however, about £1 per tree. Some estates, it is said, average a good deal more, which means that there are trees that give a great deal less. The waste of land occasioned by maintaining poor yielding trees is pointed out, and the journal referred to urges cacao growers to aim, by means of good cultivation and manuring, at an average of 4 to 5 lb. per tree of dried cacao per annum. The maintenance of humus is important, and this can be done by mulching or by growing such green dressings as will grow under shade. The general sanitation of the orchard must also receive systematic attention.



THE FUTURE OF LOGWOOD.

The following article from the *West India Committee Circular* on the position of the logwood industry will be read with interest:—

Among other industries which have come into their own again since the outbreak of war is that of logwood. This tree, known to scientists as *Hæmatoxylon campechianum*, furnishes the finest black, dark blue, and purple dye in existence, which has the advantage, not possessed by aniline dyes, of being absolutely 'fast.' That is to say, it neither runs' nor 'fades.' Unlike indigo, which once flourished in the West Indies but succumbed to careless cultivation and foreign competition even before the manufacture of aniline dyes, logwood has always enjoyed a market, though by no means so large a one as its merits deserve. The chief demand for the wood has in recent years been in America and France, where home-made dyes are protected by tariff against German substitutes. It has been asserted that, with the improvement in aniline blacks, the use of logwood for dyeing gradually became restricted to finer qualities of black cloths, stockings, etc., because of the greater facility in the application of the said anilines. It may be that owing to the prevailing habit in France, and to some extent in America, of wearing the *frac* or dress-coat in the day-time on official and matrimonial occasions, it is of the utmost importance that those garments should be coloured by a dye which is proof against the effects of the sun, and will not turn rusty and seedy-looking in the daylight. The dye-using trades in the United Kingdom have, on the other hand, shown a preference for the cheaper, more easily applied, and inferior German dyes, with disastrous results to themselves when supplies thereof were unobtainable. It may here be explained that logwood is widely distributed in Yucatan, British Honduras, Jamaica, Haiti, and to a lesser extent in several other West Indian islands. Originally the general practice was to ship the wood itself—a costly business, especially in these days, owing to its bulk—but for the past twenty years a factory has been in existence near Spanish Town, where the dye has been extracted from the wood and shipped either as logwood extract or haematoxylin crystals, while more recently a second factory, established by a combination of British dye-works firms, has been successfully producing the same products at Lacovia, in St. Elizabeth. Some years ago the makers of logwood extracts in Havre formed a combination, but probably owing to the handicap of heavy freights on the bulky raw material, the Jamaica-produced extracts began to compete successfully with their products, even in their own market. Even in the United States similar competition must have been felt. The outcome appears to have been the formation of a merger or trust whereby the businesses of the two Jamaica factories, those of the French combine, and the largest of the American concerns were united. One of the results of this combination of interests was the practical abolition of competition for the purchase of logwood in Jamaica, and, we believe, in Haiti. The management of the trust in Jamaica, buying alike for the local factories' required ments and for those of the States and France, has secur a virtual monopoly of the trade, to the obvious disadvanta of the growers. One effect of this was that, whilst became unprofitable to cut the logwood growing at a distance from the ports, that in close proximity to the was becoming exhausted. When war led to the exclusi of German dyes from the States as well as from the bell erent nations, many moribund logwood dye industries spra into life again. As usual, the Americans were first in t field to realize their requirements of the raw material, a large contracts were quickly placed in Jamaica. When t British dye manufacturers, who were outside of the Tru discovered that there was room for them also in t enlarged demand for haematoxylin they experienced temporary difficulty in procuring supplies of wood fr Jamaica, and urged the Government to bring pressu to bear on the Colonial Governments to take steps enable them to secure supplies without having to clin for them—a proceeding which, we may say, the owne of logwood trees properly regarded as not being 'cricket,' we may be pardoned for mixing metaphors. Prices, howev which before the war had been as low as about £2 10*s.* p ton—a price which made the cutting of trees at any distan from the port of shipment unprofitable—had meanwhile so ed to about £8, and as there appeared grave danger speculation by outsiders who had hitherto taken no intere in dyewoods, which would have been very injurious to t trade, the export of logwood and its products was temporari prohibited; but the embargo was soon raised when it w found that the requirements of the British trade amounte only to a matter of 7,000 tons, with which quantity th were easily supplied. Apparently, however, this very acti served to stimulate the speculation it was hoped to preven and prices advanced as high as £11 f.o.b., a somewhat fic tious price, leading to some over-supply, which, coupled wi excessively high freights, and scarcity of sailer tonnage, h temporarily depressed the market. It is to be hoped th after the war, steps will be taken to reorganize the logwoo industry and to place it on a sounder basis. This can be be done by the establishment of further logwood extra factories in Jamaica and Belize, and though the existin processes are 'secret' it should be within the powers of man of our chemists to devise means for extracting the essenti product of the logwood tree for shipment in an economic form. There must be no more peaceful penetration o British Colonies by foreigners to the extent of controllin what might be valuable industries and provided that securit against cut-throat competition is granted by the Mothe Country by preferential treatment, there is no reason why really flourishing logwood industry should not be built up i Jamaica, British Honduras, and elsewhere.

An interesting article concerning the utilization of oil seed for human food appears in *The Times* (Trade Supple ment) issued in September 1916. It is pointed out tha Great Britain and France practically command the supply of oil-seed, but that in certain quarters the United States is deflecting supplies to that country where there are indications of a growing industry in the manufacture of mar gerine. Special reference is made to the deflection of copra produced in the British Pacific Islands from Sydney to San Francisco. The article concludes by urging that the allied countries should take action to maintain their supplies of raw material and develop industries by means of them.

SUGAR INDUSTRY.

PROGRESS OF SUGAR PRODUCTION IN CUBA.

The data given in the notes on page 323 of this issue refer to the crop of 1913-14. Since then some twelve new houses have been erected, all of which have had at least a crusher and 12-roller outfit installed, and one of which has been designed from the start for crusher and 15-roller. With the present high prices there has been imported into Cuba much new machinery, and several of the older milling outfits have been torn down and the less efficient trains been converted into 12-roller tandems. The outstanding feature in Cuban development during the last three years has been the extraordinary interest, in some cases amounting to a mania, for electrification. Of the advantage of the centralization of all the small units in one power producer there can be no doubt; but many engineers look askance at the electrification of the grinding plant; there is no centralization here, but rather a decentralization with a double conversion of power and its consequent losses.

In Western Cuba there is an increasing interest shown in the use of fertilizers, in the possibilities for irrigation, and in the use of mechanical as opposed to manual cultivation of the cane.

Exports from St. Lucia.—The Agricultural Superintendent of St. Lucia (Mr. A. J. Brooks) has forwarded the following returns showing the exports of produce from St. Lucia for the periods January 1 to August 15, 1916 and 1915:—

		Jan. 1 to Aug. 15 1916	Jan. 1 to Aug. 15 1915
Bay oil	galls.	231	24
Cacao	cwt.	10,397	10,961
Coco-nuts	No.	61,271	59,232
Copra	cwt.	53	62
Honey	lb.	28,512	28,120
Limes	brls.	2,334	564
Lime Juice raw	galls.	1,080	1,083
,, ,, conctd.	,,	3,137	5 858
Lime Oil	,,	90	297
Logwood	tons	790	377
Molasses	galls.	68,076	...
Rum	p. ,,	14,456	9,389
Sugar	cwt.	87,028	90,931
Syrup or Fancy Molasses	galls.	1,565	...

The satisfactory increase of bay oil will be noted. It is likely that this item will become an important one in the exports in the near future as the local factory is now being enlarged to undertake the manufacture of bay rum on a large scale. Some idea of the extension in this business may be obtained from the fact that the Management is now spending annually something over £1,500 on the purchase of fresh leaves from the peasants in the Choiseul, Laborie and Gros Islet districts. A second factory for the manufacture of bay oil has recently been opened in Castries.

The lime exports for the period under review would have been much greater if shipping facilities had been better. A considerable quantity of juice is stored awaiting shipment.

Information has been furnished by the Agricultural Superintendent, St. Lucia, to the effect that 218 casks of concentrated lime juice and 72 carboys of lime oil were shipped from St. Lucia by the S.S. 'Catalina' on September 28. It is understood that the total would have reached 260 casks but a few were 'short shipped'. The foregoing is a record shipment for St. Lucia, and indicates that good progress is being made in the lime industry. Included in the above shipment of concentrated lime juice were 45 casks shipped by the Goverment Lime Juice Factory. This quantity constitutes a record for the Factory.

The House-fly in Relation to the Pen Manure Heap.—In the Veterinary Series of the *Review of Applied Entomology*, Vol. IV, pp. 108 and 109, a summary is given of a paper appearing in the *Journal of Agricultural Science*, describing some experiments on the house-fly in relation to the manure heap. The object of the work was to test the fly-breeding capacity of the pen manure heap in the open as distinguished from heaps close to dwellings, and to ascertain how far it is true that all manure heaps, wherever placed, breed flies. Records of the experiments are given in the original paper in detail and the following general conclusions are stated to have been reached. 'The house-fly will breed in large numbers in stable refuse stored close to dwellings, the controlling factor being the dwellings rather than the stable refuse, the latter providing a breeding place for flies visiting the house in search of food: the open farm manure heap far from houses is but little frequented by house-flies: spent heaps under rural conditions produce practically no flies at all; the farm heaps though producing hardly any house-flies are a prolific source of *Stomoxys calcitrans* and for the protection of farm animals all such heaps should be specially treated; when the farm dwellings and buildings adjoin one another, the danger is even greater especially if dairies and other food-preparing departments are in proximity to farm refuse. Town manure heaps should be far more strictly regulated than at present. In addition to *S. calcitrans* which, though regarded as chiefly a pest of horses, is a serious pest of man, *Musca autumnalis*, De G., is a great nuisance in houses, entering attics and disused apartments in enormous numbers in autumn So-called hibernating house-flies are almost invariably of this species. No difficulty was found in breeding this fly from cattle dung found in fields.

For further information on the subject of the house-fly see Insect Notes in the last issue of the *Agricultural News* and the editorial in this issue.



GLEANINGS.

The successful introduction and spread of the algaroba tree in Hawaii has interested, according to the *Hawaiian Forester*, many in other parts of the world where similar climatic conditions exist. It is stated that this has been evidenced by requests for algaroba seeds from parts of South Africa, Southern Australia, China and Madagascar

In the St. Lucia *Gazette* for July 29, 1916, a notice is published prohibiting the importation into that colony from Antigua of any equine unaccompanied by a certificate signed by the Government Veterinary Surgeon of Antigua that such animal is not affected with *Epizootic lymphangitis* nor been in the neighbourhood of the disease for three months previous to embarkation.

A copy has been received of the rules for the government and protection of the Botanical Station, Castries, St. Lucia, made by the Governor-in-Council under the authority of Section 2 of the Botanical Station Ordinance, 1890. These rules consist of by-laws designed to regulate vehicular traffic and the conduct of visitors. Anyone acting contrary to the rules is liable on conviction to a penalty not exceeding £2.

According to a report in the *International Sugar Journal* the ash of banana stalks and skins contains a large percentage of potash with practically no soda. The percentage of potash is approximately 50. It is suggested that in view of the present great shortage of potash salts, municipal bodies should set aside all vegetable refuse from the markets, so that they could be treated for the recovery of this constituent. A similar suggestion might be borne in mind in the West Indies.

A short article on the recent development of German agriculture, in *Nature* for August 17, 1916, shows that the two chief factors in the recent remarkable development of German agriculture are her settled economic policy and her well-thought-out system of agricultural education. The demand for well educated managers is greater than in England and scientific knowledge as regards soil fertility is more skilfully applied. As well as this, Germany is fortunate in that she has not only immense deposits of potash salts, but also vast areas of light soils able to give abundant returns from these manures when skilfully applied.

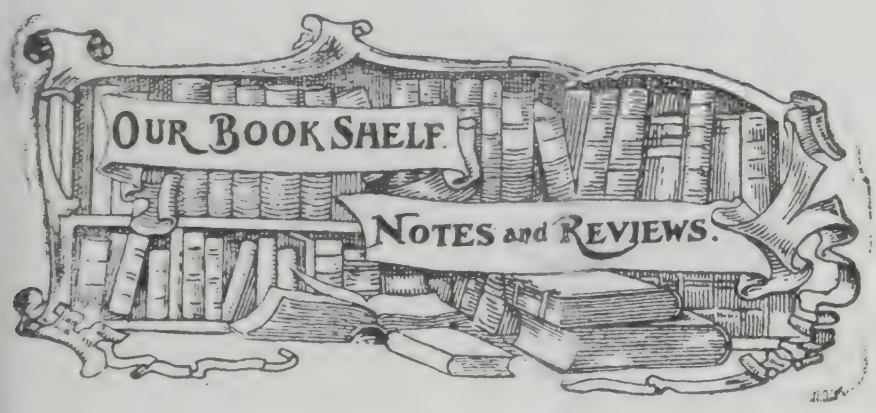
As the result of a discussion between the Imperi Commissioner of Agriculture for the West Indies and t Superintendent of Agriculture for the Leeward Islands, regard to the advisability of importing cane plants in Antigua from Trinidad on account of the prevalence froghopper (*Tomaspis* sp.) in that Colony, the Governme of Antigua, acting on recommendations put forward, h issued a Proclamation under Ordinance 4 of 1897, prohibiti the importation of cane plants or parts of sugar-cane in Antigua from the island of Trinidad. The Proclamation dated September 27.

An interesting table giving the sugar crops of the wor for 1913-14 to 1915-16 appears in the *International Sug Journal* for August. The total cane sugar crops for t world 1915-16 was 10,583,079 tons, an increase of near a million tons over the average of the past years. It is wort observing that Peru, Argentina and Brazil are now producin between them over half a million tons of sugar annually Nearly all countries show an increase in production, on exception is Java but this was due to an unfavourable season On the whole high sugar prices had been reflected all ove the world in increased production.

The report of the British Cotton Growing Associatio on a meeting held on September 5, refers to the distributio of cotton seed in Lagos for planting the 1916-17 crop. U to date, 765 tons of seed had been sent out, which points t a considerable increase in acreage and a large crop. There has been considerable difficulty in getting cotton shipped from West Africa this year, but the Imperial Governmen has rendered great assistance in regard to improving matters It is reported that good cotton has been received from the Sennar Provinces of the Soudan where the lands are period ically inundated by the overflow of the Blue Nile in flood times.

Under the recommendation of Colonel Cotton who owns extensive properties in the Leeward Islands, Messrs. R. W. Hobbs & Sons of Gloucestershire have forwarded an illustrated catalogue of their dairy shorthorns with the idea that these cattle are the best dual purpose animal for improving beef and milking qualities in West Indian stock. The firm referred to are well-known pedigree animal breeders and have won first prizes at all the leading shows. A special feature of their business is a guaranteed milk supply department, where milk is collected and bottled under the most asceptic conditions and sent to London to be sold for consumption by children and invalids.

It has not yet been definitely mentioned in this journal that the Imperial Department of Agriculture for the West Indies has issued in card form a useful table of analyses showing the composition of pen manures and allied organic manures commonly employed in these islands. The substances referred to include cotton-seed meal, cacao husks, seaweed, pigeon pea stems, sweet potato vine, mahogany leaves and pods, bat guano, grass used for mulch and many other substances of a similar character. The table besides giving a percentage composition of these substances states the number of pounds per ton they contain of phosphoric acid, potash, nitrogen, organic matter, water and ash. Those who are interested in the important and essential matter of maintaining the h supply in the soil should find this table of value.



THE PRINCIPLES OF AGRONOMY. By Franklin S. Harris, Ph.D; and George Stewart, B.S. *New York: The Macmillan Company, 1915.* Price 6*s.* nett.

A characteristic feature of this text-book of field cultivation is that it is illustrated throughout with excellent photographs of farm crops, implements and operations. The book is designed for schools giving more than one course in agriculture; its study should probably precede instruction in horticulture or animal husbandry. A knowledge of botany and chemistry, although not pre-supposed would assist in a better understanding of some or perhaps all of the chapters. An interesting part of the book of general interest is that dealing with the physical properties of soil and especially Chapters IX and X concerning the water of the soil and the control of soil water. This latter aspect of soil physics is exceedingly well treated, and information concerning irrigation, drainage and dry farming is adequately illustrated with original photographs showing various systems of water control.

Most of the crops dealt with belong to the temperate zone. Cotton, however, and sorghum, together with provision crops like sweet potatoes receive attention. The last part of the book (Part IV) dealing with field management is original in its scope and treatment, and will prove suggestive to the general reader.

CROP EXPERIMENTS IN FIJI.

Some interesting results are recorded in the report of the Superintendent of Agriculture, Fiji, for 1915, having reference to plot experiments with certain crops that are also grown commonly in the West Indies.

Planting at different distances was tried with both maize and peanuts. In the case of maize better yields were obtained with wider planting, namely 4 feet by 3 feet, than with closer planting, namely 4 feet by 1 foot. In regard to peanuts the difference between the results obtained from different methods of planting was not nearly so pronounced as in previous experiments of the kind, the decrease being 2·8 per cent. and 8·3 per cent. respectively, of the 3 feet by 1 foot method for the 3 feet by 2 feet and 3 feet by 3 feet plots.

The experiments with sisal hemp have indicated that the distances in use (8 feet by 8 feet) do not give the plants room for the best development. While greater distances seem desirable, it has to be remembered that an increase of planting distances reduces the number of plants per acre. As regards time required for maturing, a plot planted with sisal hemp in the middle of 1912 had some plants ready for milling at the beginning of the year under report. On this plot again the distance used was 8 feet by 8 feet and the plot consisted of 920 plants (1·35 acres).

The report under review then gives some information concerning coco-nuts. It is stated that some of the coco-nut palms planted in December 1907 fruited during the year; it is added that one palm carried seventeen young nuts though no nuts actually matured during the year. Considering that these palms are now eight years old, the fact that they have just begun to bear does not appear from West Indian experience to be a particularly satisfactory result. On good soil coco-nuts may be expected to come into bearing in five years.

In December 1914 a gale struck Fiji and damaged the lime trees in the Nasinu station. Most of the fruit was blown off the trees, though the trees themselves were not seriously hurt. The fruit that remained was used for seed purposes.

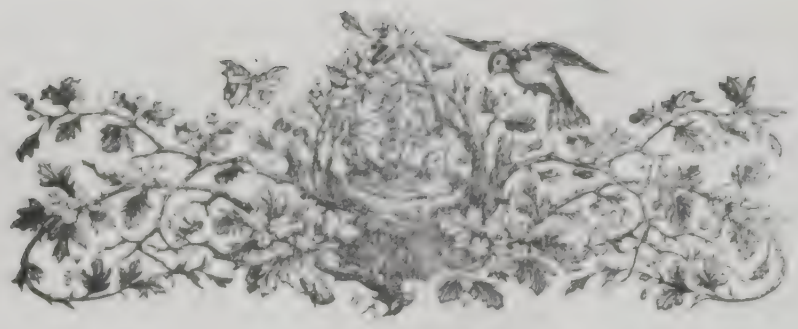
Plots of onions were started during the year. It is stated however, that germination was an absolute failure and that the plot was abandoned.

SUBSTITUTE FOR SUGAR.

One of most important demands for sugar in Great Britain is for jam making, and the recent necessity for economy together with high prices have led to suggestions being made in regard to the employment of substitutes. A statement has appeared in the public press, says the *Gardener's Chronicle*, that benzoate of soda may be used. The English Board of Agriculture, however, has called attention to the fact that this substance is quite unsuitable and has warned the public against its use. Serious consequences might result from any attempt to substitute this substance for sugar.

Another suggestion is that regarding the employment of glucose in place of sucrose (cane sugar). This suggestion emanated from the Board of Agriculture, and has met with a certain amount of approval. There seem to be difficulties however, about the purchase of the necessary syrup. That glucose is largely used in the wholesale manufacture of jam, says *The Times*, is vouched for by a leading manufacturing company, but sugar merchants in Mincing Lane appear to doubt whether its use would find favour in the domestic production of jam.

Under the heading of Rubber Stratagems of the Blockade, the *India Rubber World* for September 1 gives some astonishing facts concerning devices arranged to pass through contraband rubber to Germany. It is stated that rubber has been found in the guise of rusty iron toys, sponges, and the inside filling of various articles, from tinned meats to broom handles. On one ship 4,000 packages, supposedly bread for British prisoners in Germany, were found to contain 1 lb. of rubber each. Another vessel carried 17 tons of coffee beans in 250 sacks in which large quantities of crude rubber were concealed. One item of a miscellaneous cargo consigned to a neutral port consisted of many sacks of onions of excellent appearance, but when the examining officer selected one at random and dropped it on the deck, it bounded back into his hand.



AGRICULTURE IN THE NORTHERN GRENADINES.

Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, has recently forwarded two reports, one by the Assistant Agricultural Superintendent (Mr. C. S Harland, B.Sc.) on a visit to Bequia, Canouan and Union, and the second by Mr. Sands on a visit to Balliceaux and Battowia paid by himself and Mr. Harland conjointly. Particular attention was devoted to questions connected with the cotton stainer, and some interesting information was obtained.

In Bequia, the 'John Bull' tree (*Thespesia populnea*) does not grow, but silk-cotton trees are abundant. Observations show that if silk-cotton trees were destroyed and the perennial cotton carefully pruned back as soon as picking is finished, there should be little trouble with internal boll disease, which at present exists to a considerable extent. The destruction of old cotton plants ought to be vigorously enforced as it is allowing leaf-blister mite to become prevalent.

In regard to the general condition of crops, it is said that they are backward. The experimental plot of corn planted last September was a useful demonstration and much needed to make the people realize the importance of good cultivation. Following the cultivation of corn on this plot, Bengal beans were planted: these grew well and quite prevented the growth of weeds—again a useful demonstration.

It is suggested that a permanent experimental plot be established.

In Canouan Mr. Harland discovered the interesting fact that some years ago the owner had destroyed large numbers of silk-cotton trees with a view to controlling the cotton stainer and the result had been remarkable as is shown by the fact that the percentage of stained cotton shipped from Canouan is considerably less than 1 per cent.

The general condition of corn and cotton in Canouan is better than in Bequia, but the crops have been much retarded by droughts.

As regards the island of Union it was observed that the internal boll disease is never troublesome in any district except the Chatham district where there are large numbers of silk-cotton trees. In this island it is obvious that the cotton stainer is able to use perennial cottons to carry them over from one season to the next.

The general condition of crops is reported to be poor, lack of rain or rather lack of a proper distribution of rain being the chief cause.

It is possible that advantage will be taken in future of the credit system of sale of Sea Island cotton seed which has been inaugurated in connexion with the St. Vincent Government Cotton Ginnery.

The report on a visit made by Mr. Sands and Mr. Harland to Balliceaux and Battowia contains items of natural history of some interest. The places mentioned are small islands of the northern Grenadines owned by a private individual. They lie east of Bequia and south south-east of St. Vincent. They had not been previously visited by officers of the St. Vincent Agricultural Department.

Balliceaux, the southernmost and larger of the two islands, was visited first. It is devoted solely to the rearing of large and small stock and poultry. A considerable portion of the land is therefore under pasture. All cultivation is carried on on the sheltered southern slopes of the island. The chief crops are Sea Island cotton, Indian corn and peas of various descriptions. The cultivated area is estimated at 36 acres. The soil is described as being a very rich loam, the fertility being due no doubt to the guano formed from the droppings of the large flocks of sea-birds which have made and continue to make this island their home.

Sea Island cotton has for a number of years past given excellent returns, and the report states that the young crops look very promising. Flat cultivation is practised, and although the plants are widely spaced, about 5 feet each way, Mr. Sands was told that they would eventually cover the ground. In regard to cotton, several interesting observations were made in connexion with insects, and it is hoped that specimens will be collected and forwarded for examination.

As no silk-cotton or 'John Bull' trees appear to exist on the island, a search was made for other native food plants of the cotton stainer, and the chief ones found proved to be the wild ochro (*Malachra capitata*), a herbaceous plant which does not occur commonly in St. Vincent. Another food plant seen was the cultivated ochro. The control of the cotton stainers in this island would seem to present little difficulty.

The leaf-blister mite was seen on a few young plants and the infestation was traced to old cotton stalks which had been overlooked last season. Predaceous insects were well represented and the manager has promised to collect and forward specimens for identification.

Of leguminous crops, the black-eye pea is the chief one cultivated, but the Lima and bonavist beans were also noted. The growth and bearing of the black-eye pea were particularly good. Papaws and water-melons were abundant. The report states that the remarkable size and healthiness of the papaw trees were very striking, and the possibilities of the manufacture of papain should be considered by the owner of the island.

Some facts are given in relation to wild cats that are worth noting. The position is as follows: Some years ago cotton and corn were being eaten by rats and mice and domesticated cats were introduced to catch the vermin. The cats eventually became wild and took to the rocks and 'bush'. Here they bred rapidly and became so numerous that they threatened to destroy nearly all the bird-life on the island by their depredations on nests with young birds. They also destroyed the valuable ground and other lizards. So alarming did the situation become that the manager applied to this Department for a remedy as he feared that noxious insects would increase and destroy his crops. The use of strychnine was advised. The poison was laid down and satisfactory results were obtained.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of August:—

The month of August, even in peace times, is always a slack business month, as it is indeed the holiday month of the year. And though, on account of the war, no general holiday has been observed, business has more or less been affected in the drug and spice trades, as well as in other branches of commerce. But though the quantities of individual products dealt with have been restricted, prices generally have shown but little change since our last report.

NUTMEGS, MACE AND PIMENTO.

At the spice auction on August 16, 267 packages of West Indian nutmegs were offered and sold at an advance on previous rates of 1*d.* to 1½*d.* per ℔. At the same auction 150 packages of West Indian mace were also offered and sold at advanced prices. Pimento also realized higher prices at the beginning of the month, but at auction on the 16th it was slightly easier; 56 bags of fair quality being disposed of at from 2¾*d.* to 2⅞*d.* At the close of the month, however, it was stated that some sales had been effected at 3⅛*d.* per ℔.

SARSAPARILLA.

At the auction on the 24th of the month sarsaparilla was fairly well represented by 6 bales of grey Jamaica, 37 of native Jamaica, 15 of Lima, and 20 of Mexican. All the grey Jamaica was disposed of at 1*s.* 10*d.* per ℔. Of the 37 bales of native Jamaica 9 bales only met with purchases at 10*d.* per ℔. for palish red, and partly sea-damaged, and 9*d.* for inferior yellowish, and grey; of the 15 bales of Lima, 2 only were sold, fetching 1*s.* 7*d.* per ℔., none of the Mexican was disposed of.

CITRIC ACID, LIME OIL, LIME JUICE, KOLA, CASHEW NUTS, ANNATTO, CASSIA FISTULA AND ARROWROOT.

At the beginning of the month citric acid was firm at 3*s.* 2*d.* per ℔., but towards the middle of the month it had dropped to 3*s.* to 3*s.* 1*d.*, at which rate it stands at the time of writing. At the beginning of the month also West Indian distilled oil of lime was offered at 8*s.*, and hand pressed at 9*s.* per ℔. at which figures it stands at the time of writing. In the middle of the month raw Jamaica lime juice was in fair demand at 3*s.* 6*d* and Dominica at 3*s.* per gallon. Kola was in good supply at auction on the 24th of the month when 116 packages were offered, and only 26 sold, fair Ceylon halves fetching 5½*d.* per ℔. and 9 bags of West Indian 6*d.* to 6¾*d.* per ℔. Cashew nuts were also well represented at auction on the 24th of the month by 176 packages, 22 only being sold, 17*s.* being paid for wormy and husky nuts. At this auction also 47 packages of annato seed were offered but failed to find any buyers. Fourteen packages of Cassia Fistula pods were also offered with a like result. Arrowroot was stated at the beginning of the month to be in increasing demand, manufacturing St. Vincent fetching from 2⅞*d.* to 3*d.* per ℔.

The following extract from an article on the Port of London, in the *Times Trade Supplement*, will be of interest in connexion with our usual monthly article on drugs and spices. The article says: 'The drug department at the Authority's warehouse in Cutler street is displaying exceptional activity as the result of the war. An increasing quantity of high class drugs is arriving from abroad, and in dealing with these the experts are very much in evidence. That their duties are efficiently performed is testified by the fact that it is most unusual for consignees to carry out for themselves these sorting and grading operations. In no other port of the country is such care and skilled knowledge applied to such an extraordinary variety of commodities as in the Port of London. Indeed, the excellence of this side of the Port's work is traditional, and vast quantities of goods are consigned to London simply to secure the benefit of the "hall mark" which the examination and classification by the Authority confers.'

THE FUTURE OF AGRICULTURE IN JAMAICA.

The adverse circumstances that have affected the banana industry, the staple industry of Jamaica, during the past three or four years has led the Director of the Department of Agriculture, in his annual report for the year ended March 31, 1916, to discuss possible changes in the industries of the island which may occur in the future. The occurrence only recently of another hurricane that has resulted in the complete destruction of the banana crop, makes the remarks of the Director even more pertinent, and points to the grave economic condition in which the island has been placed.

In the course of his observations the Director points out that during 1915-16, shortage of tonnage was severely felt particularly, as bananas require a large amount of shipping in proportion to the sale value of this product. Banana planters have suffered such severe losses that the mortgaging of estates is becoming general and many are considering the revision of the major industry, bananas, in favour of sugar. The prospects before the expansion of the cane-sugar industry in Jamaica have been shown through an enquiry of the West India Committee to be very great; and the fact that this crop is largely resistant to the effects of hurricane of moderate intensity should lend encouragement to the idea of extending the area under this crop. The scheme is supported by the fact that the demand for Jamaica rum is likely to extend as a result of its use in the British forces.

As regards cacao and coco-nuts, during 1915-16, it is stated that the former fetched high prices, while coco-nuts have been in good demand. Logwood has been in great demand at very lucrative prices. An encouraging trade in high class Jamaica cattle with Cuba developed during the year, and some of the leading breeders of draught and beef cattle exported to Cuba valuable consignments of stud animals.

MARKET REPORTS.

London.—The West India Committee Circular, September 7, 1916.

Arrowroot—No quotations.
Balata—Sheet, 3/3 to 3/5; block, 2/10,
Beeswax—No quotations.
Cacao—Trinidad, 78/6 to 84/-; Grenada, 78/- to 84/-; Jamaica, 81/- to 82/6.
Coffee—Jamaica, no quotations.
Copra—£28 15*s.* to £29 15*s.*
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—35*s.* to 59*s.*
Lime Juice—Raw, 2/9 to 3/-; concentrated, £23; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—8*d.* to 2*s.* 8*d.*
Nutmegs—10*d.* to 1*s.* 2*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 3*s.* 3½*d.*; fine soft, 3/-: Castilloa, no quotations.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., September 16, 1916.

Cacao—Caracas, 16¼c. to 16½c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 13¼c. to 14c.
Coco-nuts—Jamaica and Trinidad selects, $42·00 to $45·00; culls, $23·00 to $25·00.
Coffee—Jamaica, 10c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 62½c.; Antigua and Barbados, 60c. to 62c.; St. Thomas and St. Kitts, 58c. to 61c. per lb.
Grape Fruit—Jamaica, $3·75 to $5·00.
Limes—$3·75 to $4·50.
Mace—47c. to 52c. per lb.
Nutmegs—17c.
Oranges—Jamaica, $3·50 to $4·75.
Pimento—5c. per lb.
Sugar—Centrifugals, 96°, 5·52c; Muscovados, 89°, 4·77c.; Molasses, 89°, 4·645c. all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 21, 1916.

Cacao—Venezuelan, $15·75 to $16·00; Trinidad, $16·00 to $16·25.
Coco-nut Oil—$1·18 per Imperial gallon.
Coffee—Venezuelan, 13½c. to 14c.
Copra—$5·25 per 100 lb.
Dhal—$7·00 to $7·25.
Onions—$3·50 to $4·00 per 100 lb.
Peas, Split—$11·50 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·50 to $7·75; White, $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., September 20, 1916; T. S. Garraway & Co., September 19, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·50 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $5·00.
Peas, Split—$9·65 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·69 to $6·50.
Rice—Ballam, $7·35 to $7·45; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, August 31, 1916; Messrs. Sandbach, Parker & Co.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	
Balata—Venezuela block	——	
Demerara sheet	$65·00	
Cacao—Native	12c. per lb.	
Cassava—	——	
Cassava Starch—	——	
Coco-nuts—	$20 to $24 per M.	
Coffee—Creole	14c.	
Jamaica and Rio	15c. per lb.	
Liberian	——	
Dhal—	$7·00 to $7·25	
Green Dhal	——	
Eddoes—	$1·20	
Molasses—Yellow	None	
Onions—Teneriffe	2½c.	
Madeira	4c.	
Peas—Split	$12·00 to $12·50	
Marseilles	——	
Plantains—	24c. to 48c.	
Potatoes—Nova Scotia	$4·00 to $4·50	
Lisbon	——	
Potatoes—Sweet, B'bados	$2·40	
Rice—Ballam	$7·00 to $7·25	
Creole	——	
Tannias—	$1·44	
Yams—White	$2·64	
Buck	$3·12	
Sugar—Dark crystals	$4·50 to $4·60	
Yellow	$5·00 to $5·10	
White	——	
Molasses	——	
Timber—Greenheart	48c. to 72c. per cub. foot	
Wallaba shingles	$4·75 to $6·75 per M.	
,, Cordwood	$2·00 to $2·40 per ton	

NO QUOTATIONS.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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West Indian Substitutes for Flour.

REPORTS have recently reached the West Indies to the effect that this year's wheat crop in the United States is relatively the lowest on record in relation to the demand; that this will seriously diminish the amount available for export, and that consequently, the prices of flour, already well above the normal, may be expected to rise to a point that will restrict the consumption of the usual quantities in these islands. The situation is further aggravated by an alleged shortage in Canada where, in the North-West, the prevalence of a disease known as 'rust' has occasioned considerable losses in this year's crop. While there will undoubtedly be a shortage in the amount of North American flour available for export at reasonable prices, the recent fall in the price of wheat in England, and the attendant facts of the case indicate that the price of wheat is being influenced by market manipulations and not merely by a shortage in supply; and it would appear unwise to view the situation, which by market adjustments may right itself, with too much alarm. The fact remains, however, that North America is the only source of flour for the West Indies, and the circumstances that have lately arisen in connexion with submarine warfare off the east coast of the United States will not tend to lessen the cost of flour or indeed of any other article shipped to these islands from North America. Already insurance rates are stated to have risen.

The whole situation, therefore, while not definitely alarming, does call for a certain amount of preparedness. The lines along which action should be taken have been outlined in communications sent from this Department to the respective Governments in the Windward and Leeward Islands, as well as in circular letters to the Agricultural Officers in the different islands. It has been suggested that attention should be directed to the cultivation in larger quantities of certain crops which can be partially substituted for flour. The principal ones enumerated are Indian corn (maize), Guinea corn, cassava, and sweet potato.

In regard to Indian corn, attention may be called to an editorial in this Journal* on Indian corn as a crop in the West Indies, where it was urged that more corn should be grown to take the place of the large amount which is at present imported. From the point

*Vol. XII (1913), No. 292, p. 209.

of view of cultivation, this crop possesses many advantages: it occupies the land but a short time, and so can be grown as a catch crop: if the seed is properly selected and planted fairly close in well manured soil, it is a very prolific crop, while the cost of the cultural operations are small.

Indian corn furnishes a grain which is a valuable food for man and for his domestic animals, and its leaves and stalks form a useful stock food. The grain contains all the elements of a perfect food, and in some respects it is superior to the other cereals. It possesses, compared with other cereals, an average protein content, a high fat content, and an average content of carbohydrate, while the proportion of crude fibre is small—smaller than in the case of wheat. In its digestibility also, Indian corn compares favourably with other cereals. The number of pounds of digestible matter in 100 lb. of maize grain is somewhat higher than in high grade wheat flour, the digestible protein alone being lower, in the proportion of about 8:9. Freshly ground corn produces a palatable meal of good flavour and of excellent food value, but owing to the presence of a large amount of oil it does not keep well. This renders degermination necessary. In regard to keeping qualities, the grain itself presents difficulties in this respect, though these can be easily got over by methods which will be referred to later on in this article. At this point the reader may be referred to Pamphlet No. 76 on the subject of Indian corn, issued by this Department in 1914.

The various forms of Guinea corn are but little used as food, except perhaps in Barbados. Considering the ease with which this crop is grown and the considerable yield of grain obtainable from some of the varieties, this is to be regretted. The neglect arises from several causes; some little trouble is necessary to separate the grain; the grain is very subject to insect attacks; and the grain is often wrongly regarded as too coarse a food for general consumption. If the best kinds were grown and suitable threshing and winnowing machines and small mills were introduced, considerable extension of the use of this grain as a human food would doubtless follow.

The sweet potato is already grown extensively in all the islands, forming the principal vegetable of the people. It is particularly valuable on account of the short time required to reach maturity. On the other hand, sweet potatoes do not keep well. In this respect yams, though they take longer to grow, have the advantage in that they can be stored for much longer periods. The keeping of such crops can be go over in a general way by converting them into mea

Cassava meal is an excellent foodstuff and suitabl as a partial substitute for wheat. The production cassava meal is chiefly carried on in the Windwar Islands. Cassava itself requires a friable soil, an where this condition obtains, the cultivation of any the excellent strains to be obtained from the Exper ment Stations—particularly in Montserrat—is to b strongly recommended at the present time.

In connexion with all the foodstuffs referred t above, it will be noticed that difficulties crop up i every case in regard to storage. On the whole, it may b said that the home-grown foods of the West Indies ar of a perishable nature and must be consumed soo after they come to maturity: they cannot, like th imported foodstuffs, be readily stored. The difficulty a regards corn can be overcome by adopting a process o drying. Means for effecting this have been introduce into Antigua and St. Vincent, where the respectiv Governments have established kiln driers capable o dealing with large quantities of grain, and o a co-operative basis. The work of the Antigu granary has been fully described in this Journal,* and the methods employed in St. Vincent are similar though an a rather larger scale. Further rises in the price of flour will doubtless have the effect of stimulating the cultivation of corn and consequently increasing the business of these establishments, for which at present there is ample scope.

The object of drying corn is principally to sterilize it. Insect life and fungi are killed, while the grain itself loses a considerable amount of its moisture. But it is important to realize that drying, and its sterilizing effect are futile, particularly as regards weevil attacks, unless adequate storage protection is available afterwards. In Antigua, vermin-proof storage tanks have been installed. Under all circumstances, arrangments must be made in this connexion.

The drying of corn on a small scale for home use might be effectively accomplished in an ordinary domestic oven, and on a moderately large scale in a baker's oven. After some little experience it should be an easy matter to regulate the heating so that the temperature remained in the neighbourhood of 150° F. for an hour or so. The extent to which the door is left open would assist in adjusting the temperature. It would be well if these suggestons were brought directly

*Vol. XIII (1914), No. 315, p. 152; Vol. XIV (1915), No. 334, p. 53, No. 335, p. 75

to the notice of householders in order that they may be prepared to act upon them if necessary.

Most of the foodstuffs referred to may be stored satisfactorily in the form of meal. Undried corn will not give meal of good keeping qualities unless the germs, which contain a high percentage of oil, are first removed from the grain. Whole meal from dried corn will keep, however, for a considerable time. Reference has been made to cassava meal. The art of making this is well worth studying by those who are not familiar with the process. It is carried on largely in Grenada, St. Vincent, St. Lucia, and Dominica, and should be more widely introduced into the other West Indian islands.

In closing these remarks on possible substitutes for wheat flour, reference may be made to the importance of rice. The cultivation of this crop is a large industry in Trinidad, and in British Guiana. It is not grown to any extent in the smaller islands, but rice grown in British Guiana is imported into the West Indian islands, and from that point of view it is desirable, in view of the possible shortage of wheat, that the production of rice in British Guiana should be maintained, if not extended, not merely for the benefit of British Guiana alone, but for the good of all the colonies in the West Indies.

WEATHER CONDITIONS AND SUGAR-CANE PROSPECTS IN ANTIGUA AND ST. KITTS.

In the following notes an account is given of the progress of the cane crop in Antigua and St. Kitts since the beginning of the current year. The information has particular reference to the effect of weather upon the crop, and a final statement is made as to future prospects.

Last January it was reported from Antigua that the cane growing in the island continued to improve, though some of it appeared a little unpromising, the result of the attack of brown hardback grubs. Nearly 5 inches of rain fell during the month. In February, 1·95 inches of rain fell. In March it was reported that the stand of young canes obtained was not as good as that of the previous year. This was regarded as being due to the heavy rains experienced during the time of planting in the previous November. Rainfall for the month, 2·25 inches. A more favourable report on the young cane crop was received for April. It was reported as rapidly improving, as a result of 4·93 inches of rain received during the month. In the next month, May, it was reported that the young canes continued to improve. Good growing weather was experienced during this month, the rainfall being 5·34 inches. During June the weather was drier, the precipitation being 2·52 inches; in certain parts of the island the young cane crop was reported as showing signs of the effects of dry weather, but it was realized that these symptoms were not serious and would soon disappear on the receipt of rain. This happened by the end of July, during which month 7·29 inches of rain fell; the young cane crop in most districts of the island looked healthy and was making good growth which, it was pointed out, had not been seriously retarded since planting took place. The crop continued to improve during August, the rainfall for which month was 5·69 inches. At the end of this month the condition of the crop was reported to be equal to or perhaps slightly better than it was at that time last year. Up to the end of August the rainfall received since the beginning of the year was 34·97 inches. During September rainy weather was experienced, and conditions were favourable for the rapid growth of cane. The rainfall figures given above refer to the Botanic Station records. The distribution throughout the island, however, was, on the whole, generally satisfactory, and as will be seen from the above observations, from a weather point of view conditions were markedly favourable for the growing cane crop. There is, therefore, every prospect of high yields on the reaping of the growing crop early next year (1917).

The following observations relate to St Kitts. In January of this year it was reported that the young cane crop was growing well and that the necessary supplies were being put in. Rainfall for the month, 3·53 inches. In February the young cane crop was still being supplied where necessary, and in some districts was well advanced as the result of a continuation of rainy weather (3·62 inches). A very favourable report to the effect that the young cane crop was growing rapidly and that the plants were strong and healthy was issued at the end of March, during which month there were falls of rain amounting to 3·13 inches. In April, however, the weather became drier (1·52 inches); but the young cane crop was stated to be looking well as a whole, though rain was much needed, especially in the valley district. In May the weather became wetter, as shown by a total rainfall of 5·84 inches. The young cane crop at the end of this month was well advanced and presented a very healthy appearance. The report supplying this information concluded with the remark 'that with the present weather prospects for next season are very hopeful.' Satisfactory growth continued during June; by the end of this month the young cane crop was well advanced, especially in the northern or windward district. According to the report, at the end of June the prospects generally speaking were very favourable. During July the early part of the month was dry, but the fine rains in the middle of the month made a great improvement in the young cane crop and the prospects for next season were regarded so far as being excellent. Rainfall for the month 8·27 inches. The crop by the end of August was still further advanced and everything pointed to good crops next season. Rainfall for August 8·24 inches. The report at the end of September was as follows: 'The condition of the cane crop at the present time is all that can be desired and there are no signs of any disease.' Rainfall for the month 4·40 inches. The total rainfall up to end of September was 41·64 inches. The rainfall up to the end of August was 37·62 inches, compared with 34·97 inches in the case of Antigua. It should be pointed out that the St. Kitts rainfall returns like those for Antigua were those taken at the Botanic Station. These stations are situated in the drier parts of the respective islands, so that the average precipitation over the whole of each island may be taken as being greater than that recorded for the Botanic Stations. It is satisfactory to be able to conclude by stating that up to the time of going to press no damage has been occasioned to sugar-cane in these islands by storms, though during the past hurricane season (July to October) cyclones have passed in the vicinity of Antigua and St. Kitts.

REPORT OF THE ANTIGUA ONION GROWERS' ASSOCIATION, 1915-16.

During the year under review, the operations of this Association have been carried on along exactly similar lines to those followed during the previous season (see *Agricultural News*, Vol. XIV, No. 351, p. 324).

During the present season's work, twenty-eight estates contributed onions to the undertaking, the total gross weight of onions purchased in this way amounting to 301,818 lb. For the season 1914-15, the total weight of onions purchased was 186,198 lb., so that the work of the season under review represents an increase of 115,620 lb. in the total amount of produce handled, that is to say, the volume of the work has increased by roughly 66 per cent.

It became necessary an acount of extension in volume of work to enlarge the premises and to effect general repairs ; in connexion with this there was an expenditure of £20 0*s.* 3*d.* In relation to constructional charges, a further sum of £8 9*s.* was refunded to the Government in connexion with the advance of £27 0*s.* 4*d.* made at the commencement of the 1914 crop.

In relation to the purchase of onions, the total amount expended on the first payment, at the rate of 1c. per lb., amounted to £628 15*s.* 9*d.*

The financing of the Association was arranged for by advances through a local firm of merchants in accordance with simular arrangements made last year ; for the redemption of these advances £180 15*s.* 2*d.* was expended. The charges for labour amounted to £93 17*s.* 10*d.*; expenditure for crates amounted to £250 13*s.* 4½*d.*

After paying all expenses, the total sum of money available to be distributed among growers amounted to £555 14*s.* or at the rate of 88½c. per 100 lb. of onions delivered; this is a considerable improvement on the results of the previous season when the bonus paid amounted to 51½c. per 100 lb.

In relation to the financing of the Association, arrangements were concluded for drawing against shipments to New York at the rate of 80c. per crate shipped; in addition, prior to the commencement of the season, a judicious advertizing campaign on a small scale was inaugurated, whereby it was rendered possible to dispose of a portion of the crop on a firm order basis. In this way 371 crates were disposed of during the past season.

The total number of crates shipped amounted to 5,353. Shipments were made to the following points: Martinique, Trinidad, Barbados, Demerara, St. Lucia, St. Vincent, Grenada, New York, Halifax, and St. John. The two largest intercolonial markets are Trinidad and Barbados: the largest proportion of the onions were shipped to New York. The West Indian markets during the year proved decidedly remunerative, but the New York market after opening very strongly fell away badly early in March; this was due, it is understood, to unseasonable weather and difficulty in handling produce.

The Association's Board regrets to report that considerable difficulties have again been experienced in relation to shipments to Canada; out of one shipment of 400 crates, 270 were washed overboard and lost during a storm; the remaining 130 crates have not yet been accounted for by the party to whom they were consigned. The Board is endeavouring to get proper representation in Canada, and to effect insurances on cargo carried to Canadian ports. In relation to shipments to New York, it should be added that satisfactory arrangements were made for insurance during the season.

This led to the average price obtained per crate during the season being somewhat low, namely, $1·50.

In relation to details of working, the entire season lasted for ten weeks, namely, from February 12 to April 15. The average number of hands employed, including two overseers, was fifty-five, the maximum in any one week being seventy-one.

The continued growth of the Association is a matter for great satisfaction, and the effect of the work done is being felt in the rapidly increasing orders for onion seed, in the formation of similar associations in other places in the Leeward Islands, and by information coming to the knowledge of the Board from various sources that the Association's work is becoming widely known and recognized in the various ports to which shipments are made. A large amount of credit is due to Dr. H. A. Tempany, Superintendent of Agriculture for the Leeward Islands, and his staff who have been responsible for the secretarial work and financial details; also to Mr. T. Jackson for his personal supervision of the onion house. The Executive Committee of the Association which met each week during crop, consisted of Messrs. A. F. Cowley (Chairman), R. S. D. Goodwin, N. Scott-Johnson, T. Jackson, and H. A. Tempany.

It is to be regretted that ill effects have been felt owing to the existence of a few growers in Antigua who still remain outside the Association; such competition merely has the effect of being productive of loss to both sides.

It may be added finally, that the system of fortnightly cables regarding the onion markets in Barbados and Trinidad has been maintained, and acknowledgement is due to the Association's representatives in those two colonies for the assistance they have rendered.

TORTOLA ONION GROWERS' ASSOCIATION.

A copy has been received of a similar report on the Tortola (Virgin Islands) Association. The membership of the Association is now 113 as against twenty-nine at its inauguration on September 23, 1915. Out of the total membership, ninety-two sent in onions to the curing house. The total quantity received was 11,633 lb. This gave after drying and curing 9,118 lb., or a loss of about 21·6 per cent. This loss is attributed to a considerable proportion of the onions being reaped before they were fully ripe. It is hoped that this will be avoided in future.

The expenses of curing, shipping, etc., amounted to $81·30, and the onions sold for $324·94. A first payment of 1c. per lb. amounting to $116·33 was made. A final payment of 1c. per lb. will now be made, making the total payment to members of $232·66. A balance of $10·98 has been carried over.

The average price received per crate was $1·89. This is regarded as unsatisfactory, and can be attributed to the shipment to the United States of 60 crates when the market was unfortunately glutted. Better results can be looked for next season as the West Indian markets will be more closely followed; this will be facilitated by the intended affiliation of the Tortola Association with other Leeward Islands Associations.

It is mentioned in the report that a great deal of disappointment is felt by members over the small returns obtained from their crops; it is pointed out, however, that yields can be considerably increased by careful attention to cultivation, etc., and after experience has been gained. In the Experiment Station, ⅓-acre yielded 3,188 lb. of dried onions. At 2c. per lb. this gives $63·76 or at the rate of $191·28 per acre. From this it will be seen that under market garden conditions, very handsome returns can be obtained, which compare

favourably with those of other crops. It may be noted here that most of the growers in Tortola are peasants, whereas in Antigua most of the members are planters with extensive properties. It will have been observed in reading this and the foregoing article that the total payment in Tortola was rather higher than that made by the Antigua Association

MANURIAL EXPERIMENTS WITH LIME TREES IN DOMINICA.

The results obtained over a period of three years at the Lime Experiment Station, Dominica, are published in tabular form in the Annual Report on the Agricultural Department of that Presidency for 1915-16.

A study of these figures indicates the progress made by the trees in the various plots since the experiment was laid out. The yield during the first year was very low on all the plots; there was a substantial increase in the second year, and a further increase during the year under review.

The uneven nature of the plots, for the reasons given in the opening paragraphs of this report, and the short time during which these experiments have been running, make it inadvisable to draw definite deductions as to the manurial requirements of lime trees. It will be necessary to carry on the experiments for a considerable number of years, and probably to extend them in certain directions to obtain reliable data.

Three or four facts are, however, so outstanding when the results of these experiments are examined, both with regard to their crop returns and the general appearance of the trees that even at this stage it is justifiable to bring them to the notice of those interested.

1. Without the application of manures the yield of lime trees is small, and the trees themselves present the appearance of having scanty foliage, lacking in colour, and the growth of new wood is sparse.

2. In these experiments the application of a complete manure containing nitrogen, phosphoric acid, and potash increases the yield per acre to such an extent that with limes selling at 3*s*. 6*d*. per barrel, and the manure costing £5 per acre, an increase of 110 barrels was obtained over the no-manure plot, which at the same valuation yielded a profit of £12 per acre. Furthermore, the appearance of the trees on the complete-manure plot is all that can be desired.

3. The application of a manure containing nitrogen and phosphoric acid, but having no potash, while increasing the yield of fruits to a marked degree over the no-manure plot, leaves something to be desired when compared with the complete-manure plot. In normal times the additional cost of supplying potash is amply repaid by the increased yield obtained.

4. The application of a mulch consisting of 5 tons of grass per acre per annum is producing a steady improvement in the yield of the trees, and in their general appearance.

It is realized by the officers responsible for these experiments that in many ways they are not altogether satisfactory. The acreage available is much too small to carry out a really efficient series of experiments. All that is claimed for them is that they are reliable indications as to the benefit to be derived by adopting a reasonable system of manuring.

No attempt is made, for instance, to demonstrate that one form of phosphatic manure is superior to another, or that one form of potash is preferable to another. Such fine points would require a large number of duplicate plots to yield reliable results. There are other important data which could be made available if we had a sufficient acreage at our disposal. In these experiments the formula selected for the manures is one containing 54 lb. nitrogen, 72 lb. phosphoric acid, and 84 lb. potash per acre, and this amount is added annually to the complete manure plot. This formula was selected because it was considered that its cost, which is about £5 per acre, is as much as is likely to be expended on manures in Dominica. It is highly probable that by increasing the quantities of the manures higher yields may be obtained. It may here be mentioned that in Porto Rico, on orange groves, no less than 62 lb. nitrogen, 131 lb. phosphoric acid, and 200 lb. potash per acre are frequently supplied with profitable results.

Again in this experiment the manure is applied once a year, usually in the month of May or June. Many planters maintain that the correct season for applying manures is in November or December. The only way to settle this question is to lay out experiments. In the meantime it may be suggested for the benefit of those who make liberal applications, that the best course to follow is probably to apply one half in June and the other half in November.

Additional experiments with lime trees are in progress in Dominica, and these will receive attention in a future issue of this Journal

RESTRICTIONS ON PLANT IMPORTATIONS INTO ST. LUCIA.

In view of the notice recently published (St. Lucia *Official Gazette* for September 23) imposing certain restrictions on the importation of Citrus plants from America and some adjacent countries, it will be useful to state for general guidance the conditions under which seeds and plants are admitted to the Colony.

All plants and seeds imported are submitted by the Customs authorities to the Agricultural Superintendent who inspects them, and disinfects them in such a manner as he deems adequate.

Should plants on arrival be considered to be infected with any pest or disease that may be a source of grave danger to the Colony, he may destroy the plants. Should there be suspicious circumstances as regards pests or diseases, he may require that the plant be planted in some safe place where he may inspect it from time to time and take such steps as he thinks fit to control any pest or disease that may be present.

The Government has the power to prohibit the importation of any particular plant from any country where a dangerous disease occurs in connexion with that plant: such a course is taken in regard to (*a*) coco-nuts from Trinidad, Tobago, Jamaica, Cuba or any part of Central or South America (see *Official Gazette*, Oct. 29, 1910); (*b*) banana plants from Trinidad, Tobago or any part of Central or South America (see *Official Gazette*, October 29, 1910); (*c*) cacao plants from South America. (See *Officicial Gazette*, April 4, 1902.)

Similarly, no Citrus plant (orange, grape-fruit, etc.) may be imported from the United States of America, Cuba, Porto Rico, Jamaica, Hayti or San Domingo.

Under the regulations just issued, no rooted plant or plant in earth may be imported from any of the places just mentioned unless they are accompanied by a certificate from the proper authority in the country in question certifying that citrus canker does not exist in the district from which the plants are taken, and that the disease has not existed there for a period of not less than two years previously. Persons ordering plants from any of those places should instruct the firm from whom they are being purchased to obtain and forward the necessary certificate with the plants.

COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 18, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report no business has been reported in West Indian Sea Island cotton, owing to the stock being exhausted.

New Crop Floridas in Savannah are commanding full prices.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 16, 1916, is as follows:—

ISLANDS. As the old crop has been entirely disposed of, leaving no stock whatever, and as the new crop will not begin to be marketed before next month, you see that until then quotations would be only nominal. The prices will be governed very much by those ruling at the time for Georgias and Floridas.

FLORIDAS AND GEORGIAS. The demand continues on account of the Northern and Southern Mills taking all offerings. The buying at all interior markets being active, very little cotton has been shipped to Factors in Savannah for sale.

The quality of the receipts has consisted principally of Fancy, rendering it difficult to buy Extra Choice, the small percentage of the grade being frequently sold along with Fancy at the same price. With larger receipts this coming week we hope we may see an easier market, or at least a steady one, with better offerings.

We quote, viz:—

GEORGIAS AND FLORIDAS.

Fancy	32c. = 33½c.,	landed.
Extra Choice	31c. to 31½ = 32½c., to 33c.	,,
Choice	No stock.	

The exports from Savannah for the past week have been 50 bales to Northern Mills, 60 bales to Southern Mills, and from Jacksonville to Northern Mills 612 bales.

CROP ADVICES. Although the weather has been generally favourable during the past week we have only to confirm our previous advices. This applies especially to the Island crop.

American cotton was first introduced into the Punjab in 1884 when Upland Georgian seed was tried. The crop grew well but survived only in the form of stray plants mixed with the native cottons. It was reintroduced in 1902, and in 1903 experiments were made with acclimatized seed at Lyallpur, but it was not until 1905 that the work was taken up systematically by the Department of Agriculture. In 1911 the area under American cotton was less than 10,000 acres, and in 1914 it was not less than 70,000 acres. It is now well established that the yield of American cotton is, on the average, better than that of the native varieties, and the critical period in its adoption is now passed. The plant has established itself by a sort of natural selection, unsuitable types having been largely eliminated by pests. The Agricultural Department has also helped by obtaining the support and co-operation of local ginners and of exporters, who have done much by issuing pure seed and securing good prices at the auctions. One of the great difficulties is the mixing with native cottons that occurs, often due to the fault of the ginners and spinners. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, February 1916.)

CHINESE VINEGAR AS A COAGULANT.

Mr. E. J. Eaton, Chemist on the staff of the Department of Agriculture, Federated Malay States, contributes the following to the Department's Journal for July:—

Enquiries having been received *re* the use of Chinese vinegar as a coagulant, samples of this substance were purchased on the local market in Kuala Lumpur, and have been investigated in the Chemical laboratory.

Chinese vinegar like English and other continental vinegars consists essentially of a dilute solution of acetic acid, but whereas the English malt vinegar is brown, Chinese vinegar is colourless. Chinese vinegar is probably prepared by the acetic fermentation of alcohol from rice, hence its colourless nature.

The following results were obtained on analysis of samples purchased from different Chinese shops in Kuala Lumpur. The price per gallon of pure acetic acid calculated on the acid content of the samples examined is also given; this has been calculated from the amount of Chinese vinegar bought for 10c., and based on the strength of the samples. These prices are approximate, since larger quantities of the vinegar could no doubt be purchased more cheaply. It is practically certain however, that if a demand arose for this vinegar as a coagulant, the price would increase considerably. It will be seen that the prices do not compare at all favourably even with present ruling prices of glacial acetic acid, at, say, $45 per demijohn (4½ gallons approx.) which is equivalent to about $10 per gallon. No coagulations have yet been made by me with this vinegar, but it may safely be stated that its coagulating power will be similar to acetic acid of a similar strength, and that the rubber coagulated with it will be similar to acetic acid coagulated rubbers.

Ref. No.	Amount purchased for 10 c.	Acetic acid per cent.	Cost per gallon calculated for pure acetic acid.
1	17 fl. ozs.	2·6	$36·20
2	16½ ,,	5·6	17·31
3	22½ ,,	4·05	17·55
4	18 ,,	6·2	14·33
5	15½ ,,	4·8	21·38
6	16 ,,	3·9	25·64
7	18 ,,	4·2	22·49

The *Geographical Journal* contains an interesting paper entitled the Synthetic Method of Determining Geographical Regions. As regards agriculture, it is said that the productive areas of the chief crops serve useful geographical boundaries. These divisions not only indicate the regions where the particular crops are largely obtained, but they correspond with the complex climatic conditions which favour the various crops, and also with the economic and social conditions which are partly the cause and partly the effect of the particular forms of agriculture; this last point may be illustrated by the well-known connexion between cotton cultivation and the employment of negro labour in the United States, with its many social and political consequences.



JAMAICA: REPORT ON THE DEPARTMENT OF AGRICULTURE, 1915-16.

In the last issue of the *Agricultural News* a note appeared containing references to some of the general observations contained in this report, more particularly in connexion with the suggested partial substitution of sugar-cane for banana cultivation in the Colony. The present review will be used to bring forward some of the special information likely to interest our readers.

Concerning diseases of animals and plants, it is stated that no animal has re-acted to the tuberculin test during the past four years, and the Government herd at Hope Station may therefore be regarded as quite free from any taint of tuberculosis. Tick fever cases were few and slight, and the dipping tank has been in regular use, the results of which are described as having been truly remarkable. It is said that as soon as the cattle get accustomed to the tank, they learn to take care of themselves and the work of dipping becomes easy and quick. The liquid used consists of arsenite of soda (80 per cent.) 2 lb., paranaph 3 lb. per 100 gallons costing 1*s.* 5*d.* on a basis of war prices.

In regard to plant diseases, there was an unfortunate outbreak of Panama disease of bananas in Portland, where the disease has been present for a long time. The disease has not been found in any new parish during the year.

In regard to the work in the Public Gardens and Nurseries, some remarks appear concerning grape-fruit seedlings. It is sometimes stated that grape-fruit do not come true from seed. There is evidence in this report to the contrary. Quite recently a grower of these fruits in one of the western parishes voluntarily informed the Department that of 500 seedlings obtained from Hope Gardens in 1901-2, only one tree is not true to type.

The distribution of plants during the last three years from the nursery shows a distinct increase. During the year under review over 20,000 cacao seedlings, 6,500 citrus, and 64,000 cane cuttings were sent out as against 7,600, 581, and 24,000, respectively, for the previous year.

An interesting fact recorded is that a banana seed was obtained at the Hope Gardens from one of the varieties of bananas sent from Kew, and efforts are being made to raise a seedling. The seed appeared to be fully developed, but it is well known that the seeds of *Musae* are very slow in germination, and it is pointed out that it will take some time before the success or failure of this attempt to obtain a seedling banana is determined.

Regarding coco-nuts, the exports of nuts for the year were 2 million less than in 1914, when a record of 29 million nuts was established.

The sugar-cane experiments conducted by the Jamaica Department of Agriculture receive attention in the report of the Superintendent of field experiments. It is believed that the new Jamaica varieties promise well and that there are two really good canes in the series J.70, J.71, J.72, J.73, J.74. The fact that these canes are very similar in appearance is mentioned, but the two best canes are not. White Transparent is still regarded the best cane, however, in Jamaica; and it is the one which is recommended with confidence to meet most of the planter's demands. As regards the manuring of the sugar-cane, emphasis is laid upon the importance of supplying the soil with humus. Experiments are to be modified with a view to increasing the area of the plot. Information presented concerning the manurial work is not very definite in this report.

An experiment designed to show the effect of artificial manures on coco-nuts was arrested by dry weather.

Further on in the report a statement appears to the effect that the cultivation of sisal is proving satisfactory. Only one weeding a year has been found necessary, and the only other operation in respect of this crop was the renewal of young suckers of which there were but few, and the supplying of the established acreage, wherever grown plants were available for that purpose. A nursery has been established at the Stud Farm, Lititz, with bulblets of both sisal and henequen received from the Hope Gardens.

While Cauto cotton has yielded moderately well in the experiment station, all trials with Sea Island cotton have proved unsuccessful.

Concerning agricultural education, it is reported that the agricultural work of the Farm School, Hope, is now one of the most efficient and well organized branches of the work of that institution.

In the Government laboratory a considerable portion of the work has to do with official analyses in connexion with public health, etc. The agricultural investigation concerned soils and subsoils, fertilizers, cane juices, feeding stuffs, tanning materials, arsenical cattle dips, and insecticides. Further determinations of the tannin content of mangrove barks were made, and in many of the samples there was over 25 per cent. tannin. The determination of the percentage of fat in twenty-one samples of fermented and unfermented cacao, supplied by leading planters and merchants, resulted in the average of 45·8 per cent., the maximum being 49·4 and the minimum 41·1; only one sample contained less than 44 per cent. It is of interest to note that the preparation of thymol powder has been discontinued, as the price of this substance has become prohibitive. There was distributed 2,103 oz. of this antiseptic during the year. This is of interest in connexion with the suggestion by the Imperial Department of Agriculture that ajowan plants which yield thymol might be usefully grown in the West Indies. That this plant (*Carum copticum*) is suited to the conditions of soil and climate is shown by the successful production of seed in Grenada and St. Lucia. In Jamaica there is no doubt much spare land in the hills that might usefully support this wild plant, and yield a product which would be of immediate value in a colony like Jamaica with its important stock-raising industry.

DEPARTMENT NEWS.

Mr. Abdul Rahim Khan, State Technical Scholar, United Provinces, India, arrived in Barbados from England on October 17. Arrangements have been made with the Department through the India Office to enable Mr. Khan to study sugar cultivation and manufacture in the West Indian islands under the direction of the Imperial Commissioner of Agriculture. Mr. Khan has spent the past three years studying sugar techique and the manufacture of machinery in Glasgow. After two weeks in Barbados, he proceeds to Antigua for three months. Mr. Khan expects to remain in the West Indies until next May.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

In view of the probable continuation of the rise in the price of wheat, the editorial in this issue deals with the question of possible substitutes for flour that can be more extensively produced in the West Indies.

This issue contains important information in connexion with weather conditions: see pages 339, 345, and 350.

A suggestive article will be found on page 350 dealing with methods of measuring growth in sugar-cane.

A review of reports on the Leeward Islands Onion Growers' Associations will be found on page 340.

Sugar Production in Cuba.

Some facts and figures concerning the production of sugar in Cuba appeared in the last issue of this Journal. These indicated the low cost at which sugar is being produced in that country: *Modern Cuba* for August reproduces the following general observations on the subject:—

'As long as great areas of virgin forest remain untouched she can easily maintain her position as the greatest and cheapest sugar producer, without material change in existing methods. In the older sugar districts, which to-day contain a larger share of the capital invested in this business, forest lands no longer exist. Here all these basic agricultural problems must be faced and solved if the next period of low prices, sure sooner or later to follow the present war inflation is not to be followed by the disastrous collapse of many heavy investments. It only takes a hasty trip through Camagüey and Oriente toshow with what feverish rapidity Cuba's remaining forests are being cut down and planted to cane. At the present rate, less than a generation will see the end of them. The entire island must then settle down to a study of cane agriculture. The importance of its problems are, therefore, sufficiently great to make it the duty not only of the mill owner and colono, but of every person in any way connected with the sugar industry to give them most thoughtful consideration.'

Trade and Industries of Turks and Caicos Islands, 1915.

Colonial Reports—Annual (No. 889) constitutes a report on the Blue Book of the Turks aud Caicos Islands for the year 1915. From this the following particulars are gleaned concerning the principal industries.

The sponge industry showed a falling off to the extent of £1,280, due, it is said, to the war now being waged in Europe. On the other hand, it is mentioned with gratification, that artificial culture of sponges continues to make satisfactory progress. Mr. George Silly, the lessee of Chalk Sound (Blue Hills, Caicos Islands), was able to report that at the close of the year 1915, his work in this direction extended to upwards of 250,000 cuttings, chiefly of the 'reef' variety. The take of 'wool' sponges has almost reached vanishing point, a condition of affairs for which no one seems able to ascribe a reason. It is suggested that it would be both interesting and valuable to have the matter investigated scientifically.

An advance of 3½ cents per lb. in the American market stimulated reaping operations in connexion with the sisal industry, and resulted in an increase of £1,580. in the exports under this head, as compared with 1914.

Not the least interesting among the sudsidiary marine products of the Caicos Islands is the export of conchs to the neighbouring republic of Haiti. This trade, which for some years had wavered between £500 and £700 per annum in value, reached its maximum during the year under review, when over one million conchs, valued at £1,217, were shipped from the

Dependency. The lobster-canning industry shows a slight falling off in the value of produce exported, but, on the other hand, 'sea shells' hitherto a waste product of the conch industry, for the first time finds a place among exports from the Dependency.

Considerable interest was shown by peasant proprietors in the Caicos Islands in connexion with the cotton industry. Samples of the cleaned staple, grown in these islands, were submitted to London brokers and were favourably reported on. Difficulties in the way of shipping, owing to the war, at present prevent immediate results in this respect, but it is anticipated that with the cessation of hostilities, a development of the cotton industry will undoubtedly follow.

Hurricane in the Virgin Islands and St Thomas.

During August, the hurricane that caused such considerable damage in Dominica passed the Virgin Islands on the 13th instant to the south or south-west of Tortola, and no harm resulted. This good luck has not been maintained, for according to a recent telegram from St. Thomas, the hurricane of October 9 which caused widespread destruction at the Danish Islands of St. Thomas, St. Jan, and St. Croix, was equally disastrous in its effects at Tortola. There being no cable communication with the Virgin Islands, details as to the damage done have not yet had time to come to hand, but judging by analogy, the situation in Tortola must be very grave. The population is chiefly composed of peasant cultivators and fishermen, and it is to be expected that most of these have lost their present means of subsistence. Help has no doubt by now been rendered by St. Kitts, and Antigua.

The first indications of this hurricane, which appears to have been the most violent one experienced for many years in the West Indies, were shown by rough seas and a falling barometer on October 7. On the 9th, in the Danish Islands, the barometer was falling rapidly with heavy squalls from the north-east, and by the afternoon the glass was as low as 28·02. The wind increased in intensity until between 7 and 8 p.m. when there was a lull. After about an hour the wind blew with redoubled strength from the west and later from the south, accompanied with a deluge of rain. The damage to house property in St. Thomas is described as enormous, and the shipping also suffered to a very grave extent. The damage in the neighbouring island of St. Croix, which is of greater agricultural importance, is estimated at about $1,000,000.

The present hurricane season in the West Indies has been one of unusual activity. The United States Weather Bureau at Washington which maintains observation stations in some of these islands will no doubt find it desirable to issue a special report on the subject.

Agricultural Administration and Research in the Leeward Islands.

A report has recently been issued on the work of the Government laboratory and the office of the Superintendent of Agriculture for the Leeward Islands, 1914-15 and 1915-16. This discribes in a clear manner the functions and scope of the laboratory and the wide range of duties attendant on the office of Superintendent of Agriculture. Besides the chemical examination of a large number of samples of widely different character, special investigations have been carried on chiefly in connexion with soil problems. As well as this the routine work of sugar analysis in regard to the sugar-cane experiments has been continued, as usual. All this work has been done under considerable pressure on account of abolition of the post of Assistant Chemist. At the same time the appointment of Chemical Assistants in the sister Presidencies of Dominica and St. Kitts has relieved the central laboratory of a certain amount of routine work.

Additional lines of activity having arisen in connexion with the office of Superintendent of Agriculture, amongst which may be mentioned the direction of the work of the Government Central Granary and the secretarial and financial work of the Antigua Onion Growers' Association, the successful administration of the Agricultural Department during the period under review is desiring of credit. In connexion with the work of this office, useful investigations have been made in regard to insect pests. Special visits to and reports were made on the islands of Redonda and Barbuda, besides the customary visits to the neighbouring Presidences of the Leeward Islands Colony.

In conclusion the report indicates the accomplishment by a single officer of a very large amount of useful and diversified work.

Blight-proof Coffee for the Philippines.

Twenty-five years ago, the coffee disease then sweeping over the entire East visited the Philippines and destroyed, according to a note in the *Journal of the Royal Society of Arts*, a flourishing industry as far as production for export was concerned.

Since that time, it is stated, the cultivation of coffee in the islands has been confined to one or two mountainous districts, where the altitude was sufficient to exclude the blight. In these localities almost every house has had its coffee patch, and on them, despite careless methods of cultivation, an excellent quality has been grown. The quantity of this product has been inconsiderable, however, from a commercial point of view, and coffee has never again taken a place of any importance in the list of Philippine exports. There has never seemed, however, any conclusive reason why a blight-proof stock should not be successfully introduced, as had been done in Java and Ceylon, with the result of rehabilitating the coffee industry of those countries to a great extent, though they had originally been almost as hard hit as the Philippines. According to the *Manila Daily Bulletin*, experiments with this end in view have been somewhat numerous,and not long ago it was announced that measures would be taken to import a supply of the *robusta* variety of coffee plants for distribution, from Java.

INSECT NOTES.

A SCALE INSECT PEST OF CITRUS AND ITS CONTROL.

A serious pest of lemons in Sicily is the scale insect *Chrysomphalus dictyospermi*. This was recorded in the West Indies as early as 1899, and has more recently been identified on West Indian material sent to Dr. Berlese at Florence. This pest appears to be fairly wide-spread in the West Indies, but it does not occasion any serious damage as it does in Sicily. It is interesting to record the fact that Dr. Berlese has found parasites on the scale sent from the West Indies, but these have not yet been fully identified. Perhaps the most important part of the investigation by Del Guercio and Malenotte in connexion with the pest, an account of which is reproduced below from the *Review of Applied Entomology* (Vol. IV, Ser. A, Part 4), is that concerning methods of control. These possess an importance as regards the treatment of scale insects generally.

C. dictyospermi was first discovered in Italy in 1895 by Berlese on *Pandanus graminifolia* in the Botanical Garden at Florence, but the present severe infestations are due to importations from France along the Riviera, whence they have spread to southern Italy. The various stages of this scale are described in detail. The number of males is twice that of the females, or even more, especially on the fruit. Tables are given to show the influence of the seasons on infestation. The temperature has a great influence on the number of larvae which emerge from the shields at the period of maximum emergence, an abrupt fall diminishing the number and an abrupt rise increasing it. A very high temperature in July, when the temperature rose to 104° F. at 1 p.m., hastened the dessication and the fall of a large number of adults which had been sprayed with a 5 per cent. solution of colloidal polysulphide of calcium. In autumn the varying frequency and quantity of rain explains the different results yielded by colloidal polysulphide sprays. In the months of February, March, and nearly the whole of April, no larvae were seen to emerge even on heavily infested plants. This observation was in apparent conflict with the presence of young larvae, but these were all born in the previous November and December. Larvae which attach themselves from mid-November onwards develop so slowly that the first moult has not taken place after a month, whereas only twelve to fifteen days are necessary with June larvae. Oviposition begins from late in April to early in May, but proceeds very slowly and the clusters never contain much more than about fifteen eggs, and may therefore often pass unnoticed. This species is certainly oviparous, but if the shield of a female be raised, it will be seen that most of the larvae have already hatched. The fact that more larvae than eggs are usually found beneath the shield accounts for the belief that the species is viviparous. Observations on Coccids of genera allied to Chrysomphalus show, however, that a species which is usually oviparous may occasionally produce living young, especially towards the end of the oviposition period. Observations on the speed with which the larvae of *C. dictyospermi* spread, show that they do not move far from the centre of infestation; they have a tendency to climb, especially if they happen to be on the trunk and larger branches, and if the lower portion of the foliage is infested, this is largely due to larvae falling from infested parts above; larvae which fall to the ground perish. External causes are therefore responsible for the spread of this p from plant to plant. Infestation is strongest on the leave and fruit, and also occurs on young shoots and on variou parts of the flower, the larger branches and the trunk bein immune. The principal causes of the spread of the inse are pruning, gathering the crop, irrigation, rain and wind Pruning carried out when the scale is very active is mor dangerous than in winter. The best plan is to prun in winter, either letting the prunings dry where they fal or removing them to a distance of several yards fro plants still uninfested. In the case of lemons, whic are also pruned at seasons other than winter, th prunings must be left where they fall, so that infestatio may be restricted to the plants already attacked. Gather ing the fruit is usually done in winter, except in th case of lemons, limes and some oranges. The danger is therefore chiefly present in these latter cases. Irri gation of the citrus plantations is less dangerous tha appears at first sight, and it is only in cases where a larv is carried by the water and thrown on a trunk around which there is no ring of foam that it is able t ascend the plant; infested leaves may, however, be carried by the water. Gentle rain falling on mobile larvae washes them down to the lower portions of the plant. A heavy rain reduces the number of larvae by washing them down to the ground, where they perish, but may carry infested leaves to considerable distances. Wind must however be held to be the most important agent in diffusion. Branches isolated by rings of cotton from the infested portion of a plant were found to be infested after a certain time if the wind was blowing. The importance of wind carriage is evident from the fact that plants sheltered from the wind are the most strongly infested, as a larger number of larvae are left on them. Strong wind and rain together act by carrying the larvae in the rain drops, as has previously been noticed by Del Guercio in the case of *Ceroplastes sinensis*, D.G.

A list of fifty-six food-plants is given, including the following:— *Acacia longifolia*, *A. retinoides*, *Arbutus andrachno*, *Callistemon* sp., *Citrus aurantium*, *C. deliciosa*, *C. Limonum*, *C. sinensis*, *Cycas revoluta*, *Eriobotrya japonica*, *Euonymus europœus*, *E. japonicus*, *Ficus stipulacea*, *Hedera helix*, *Kentia* sp., *Melaleuca* sp., *Metrosideros* sp., *Muhlenbeckia platyclados*, various species of palms, *Pandanus graminifolia*, *Phormium* sp., *Strelitzia reginae*, and *Zea mays*. Observations on these plants show that *C. dictyospermi* can develop and attain maturity on them. The Coccid was seen on some other species, but though the larvae became attached on them, they died at a certain stage probably because the juices were not suitable. This was noticed on the grape vine, peach and apricot, which in Sicily are cultivated promiscuously with citrus plants. *C. dictyospermi* was never observed on them when they were at a considerable distance from the citrus trees. They are therefore not true hosts and may be transported without any risk of spreading infestation. Nor is there any risk in the transport in winter of deciduous plants of which the leaves alone are subject to attack. It was found that the natural mortality among larvae in favourable conditions amounted to 5 per cent. before fixation. In late autumn, however, especially in rainy weather, eggs which had dried up and dead larvae were observed under the mother's shield. After fixation early in June, larvae fifteen to twenty days old showed a natural mortality of 5 to 10 per cent. Later on, the adult female mortality was 2 per cent., increasing to 15 per cent. in October and 25 per cent. late in November, at which time the mortality of adult males was 40 per cent. and that of larvae and nymphs 19 per cent. These figures were allowed for in estimating the value of insecticides.

The economic importance of *C. dictyospermi*, in Italy, varies in different regions ; at the present time the extensive citrus groves of Sicily and Calabria are the most menaced. This pest was introduced into Italy without its natural enemies. None have been found either in Liguria or Tuscany, and during 1913 and 1914 the authors noticed very few endophagous or predaceous species in Sicily. According to De Gregorio, *Aphelinus silvestrii*, De Greg., exercises useful control. The predaceous species destroy not more than 10 per cent. of the adult Coccids, and the endophagous species are even less efficient, for only one Chalcid nymph was found in about 30,000 Coccids examined. In America, *Aspidiotiphagus citranus* is a parasite of *C. dictyospermi*, while *Aphelinus chrysomphali* is reported to be useful in the Iberian peninsula. Cultural methods of control include pruning and defoliation. Pruning is valuable because a properly pruned tree offers less shelter to the Coccid against unfavourable climatic factors, and green pruning directly diminishes the number of the scales. Some growers have thought that complete defoliation is equivalent to suppressing infestation, but this cannot be the case, as infestation is not confined to the foliage

DOWN THE ISLANDS.

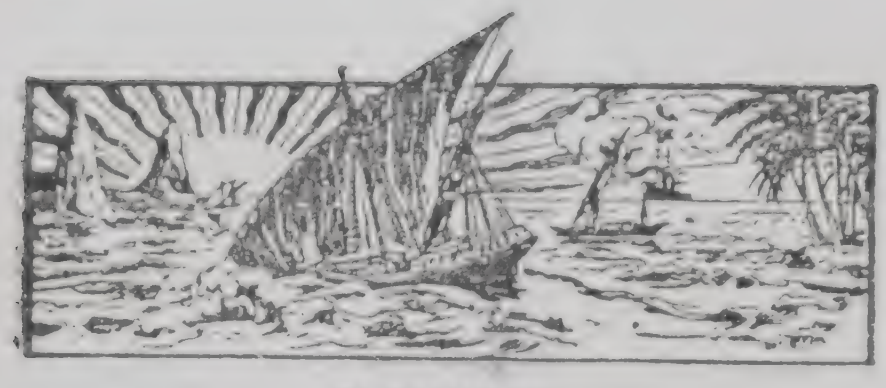
ITEMS OF LOCAL INTEREST.

GRENADA. Work in the Experiment Stations in August, the Superintendent of Agriculture writes to say, was chiefly of routine nature. The general condition of all the stations is reported as satisfactory on the whole, showing much improvement on last year. In the Botanic Gardens improvements in the nursery grounds were carried out; other operations comprised planting, grafting and budding. Plants distributed included 8,677 limes, 1,041 coco-nuts, 4 grafted mangoes, and 56 of other varieties. As regards staple crops, the prospects of the 1916-17 cacao crop, Mr. Moore says, are very promising indeed. The crop year ending September 1916 promised to be the largest on record. Lime planting on estates and holdings was making good progress. Spraying experiments for Bourbon Aspidiotus on coco-nuts have been undertaken. The weather during the month was rainy and very hot.

ST. VINCENT. Mr. W. N. Sands, reporting for the month of September, mentions the reaping of selected corn planted in the experiment stations, which gave a calculated average yield per acre of 9,865 lb. of corn on the cob. This corn was planted on banks 4 feet apart, plants at a distance of 1 foot apart on both sides of banks. Other work in the experiment stations included the collection and destruction of cotton stainers in cotton plots. Plant distribution for the month was as follows: cane cuttings 1,794, grafted mango plants 3, sweet potato cuttings 300, guava plants (South African) 12 onion seed 9 lb. Indian corn 3 lb. In the Botanic Gardens, operations were of a general routine character. In regard to staple crops, the corn (maize) crop continued to make good progress, and was particularly free from insect attack. The cotton crop also made fair progress. On many estates hand collecting of cotton stainers, when found, was practised. The black-eye pea crop turned out satisfactorily on several estates. Annexed to this Report is a report on the work performed in connexion with the destruction of food plants of the cotton stainer during the month of September. It appears from a table appended to this report, that the number of large 'John Bull' and silk-cotton trees destroyed to September 30 was 9,390 and 446, respectively, while the sum paid out for the work performed from July 28 to September 30 amounted to £74 10*s*. It is estimated that the total cost for work performed and reported will not exceed £80. The Agricultural Superintendent visited the Leeward and Windward Districts—Kingstown to Richmond and Kingstown to Overland; a number of estates were visited and the work of destroying 'John Bull' (*Thespesia populnea*) and silk-cotton trees was inspected. The Assistant Agricultural Superintendent visited Ratho Mill, Glen and Prospect estates in connexion with cotton and corn investigations. The weather was rather drier than usual about the middle of the month. The rainfall recorded both at the Botanic Gardens and Experiment Station was 8·31 inches.

DOMINICA. Mr. Joseph Jones writes to say that during the month of September efforts were made to restore order in the lime experiment station after the hurricane. Damaged trees have been pruned and uprooted ones removed; so likewise in the cacao experiment station where, close examination reveals the fact that many of the plots are so considerably damaged that the anticipated year's results will be much disturbed. For the first time since the establishment of the Botanic Gardens there was no distribution of plants during the month. Many thousands of plants, however, are ready for immediate distribution and have to be cared for; in addition, arrangements have to be made for a continuous supply, consequently the nurseries are much congested. In the Botanic Gardens satisfactory progress has been made in clearing the wreckage after the hurricane. Efforts are being made by circularising planters to estimate approximately the damage caused by the recent hurricane. The districts in the island most seriously affected by the hurricane are in course of being visited. Concerning pests, Mr Jones says the presence of root disease (Rosellinia) on Para rubber and the Nicaraguan shade tree was observed for the first time. Beyond the testing of samples of lime juice sent in by planters, the work in the chemical laboratory is for the time being suspended. The weather was normal; rainfall for the month 6·20 inches.

ST. KITTS. Mr. F. R. Shepherd reports plant distribution for the month of September to have been as follows: ornamental 12, sweet potato cuttings 300, cassava cuttings 2,200, Para beans 35 lb., white velvet beans 50 lb., and 300 suckers of Agave (sp. *cantala*) sent for planting in Anguilla. In the Botanic Gardens general routine work was carried on. Touching staple crops, the reaping of the old cane crop still continues on a few estates in the northern district. The young cane crop is well advanced for the time of year, and the prospects for next season continue to be very hopeful. The condition of the cane crop at the present time is all that can be desired, and there are no signs of any disease. The cotton crop has been considerably reduced, the area for this season being about 600 acres. In the northern district two estates have practically finished picking their crop, and have made good returns; but estates in the valley district are only now beginning to pick. Meetings of the Agricultural Society were held on the 5th and 15th instant, respectively. Results of experiments with sugar-cane varieties were submitted by the Agricultural Superintendent at the meeting on the 5th, and the Imperial Commissioner of Agriculture, who was present at the meeting on the 15th, addressed the meeting, after which a Resolution was passed approving the policy of the British Empire Producers' Association, and suggesting subscriptions from estate owners and others. The rainfall for the month was 4·04 inches; for the year 41·64 inches.



GLEANINGS.

We have been informed by the Agricultural Department in St. Lucia that garden fêtes are to be held on October 19 in the Botanic Gardens at Castries and also at the Agricultural Station, Choiseul, in aid of the British Red Cross Society.

The distribution of plants from the Experiment Station, St. Lucia, during September was as follows: limes, 3,450; oranges (budded), 6; decorative and economic, 24. There were also distributed 10 packets of vegetable seeds and 4,000 cassava cuttings.

It appears from the *Cyprus Agricultural Journal* for July 19, 1916, that some experiments have been made to find out whether Sakellarides and Sea Island cotton can be satisfactorily grown in Cyprus. It is stated that the Sea Island seemed a much hardier plant than the Sakellarides but gave much the same yield. The Sea Island stood the cold better but took longer to ripen. The Sea Island gave a smaller proportion of lint to seed than Sakellarides, namely, 98 lb., as against 108 lb. from 315 lb. of unginned cotton.

It is stated in the *Wealth of India* for June 1916 that the Government of Madras has sanctioned the starting of three coco-nut experimental stations on three distinct types of soil at present bearing this crop. It is also proposed to lease two suitable plantations for the study of cultural and manurial problems. The area under coco-nuts in the Presidency of Madras is approximately 794,000 acres; thus this experimental work would appear to be fully justified, and the results obtained will be followed with interest in other parts of the tropics.

A rather remarkable form of adulteration is described in the *Agricultural Bulletin of the Federated Malay States* for June 1916. It has been found that starch is sometimes added to rubber latex with a view to increasing its weight. The starch can be easily detected by boiling the rubber in dilute hydrochloric acid and subsequently in pure water and by crêping it on a small experimental crêping machine with hot water. From a sample by this treatment, the loss which probably consisted almost entirely of tapioca or sago starch was 50·9 per cent.

The influence of pen manure and water upon the bacterial activities of the soil is dealt with in a paper in the *Journal of Agricultural Research* for September 4, 1916. The ammonifying power of the soil is increased with the manure applied up to 25 tons of manure per acre, but the greatest increase per ton of manure was obtained in soil receiving 5 tons. The application of manure to a soil increases also its nitrifying powers. The application of irrigation water to a fallow soil apparently depresses its nitrifying powers.

The shipments of coco-nuts from Dominica have averaged for the past four years a little over ½ million nuts yearly but it is pointed out in the Report of the Agricultural Department for 1915-16, that as the local consumption is considerable. it is probable that the annual production of nuts is over the million mark. Considering how completely dependent Dominica is upon lime cultivation, it is important that every effort should be made to extend the area under coco-nuts. A fair amount of progress is stated to have been made of late in establishing new areas.

Under the heading of Molasses *versus* Gasolene, the *Louisiana Planter* for September 9 makes reference to the motor fuel produced by the South African Natalite Motor Spirit Company, which has already received attention in a former issue of this Journal. It is said that the enterprise shown in Natal in regard to this form of utilizing molasses will stimulate similar efforts in the West Indies. It will be remembered that the volatility of this fuel is increased by converting some of the alcohol into ether, while the corrosive action of the fuel is overcome by the use of an alkali.

Mention is made in the *Journal of the Royal Society of Arts* (September 8, 1916) of the great opportunity for increasing the production of cement in the Federated Malay States. In Selangor during 1915, 8,825 tons of limestone were quarried and 5,725 tons of cement manufactured, all of which was used locally with the exception of 712 tons exported. The statistics show that cement to the value of £40,000 was imported in 1915, but that is much below the average for the Federated Malay States, which is nearer £80,000. Cement is imported into the Straits Settlements to the annual value of over £200,000.

New editions have been published of two books on agricultural chemistry. The first is Dr. E. J. Russell's Memoir on Soil Conditions and Plant Growth. The *Experiment Station Record* states that a new chapter on the relationship between the micro-organic population of the soil and the growth of plants, and numerous sections dealing with recent developments of other parts of the subject have been added. The second book is the Chemistry of the Garden, described as a primer for amateurs and young gardeners, by H. H. Cousins. This book has been reprinted eight times since its first issue in 1898. This new edition receives a brief review in *Nature* for August 24.

BAY RUM INDUSTRY OF THE DANISH WEST INDIES.

The Perfumery and Essential Oil Record for August 1916, contains interesting information concerning the bay rum industry in the Danish West Indies, and other matters. According to the American Vice-Consul at St. Thomas, the cultivation of the bay tree and the extraction of the oil from its leaves provide for the island of St. John its most important industry; and the distillation of this oil, and its subsequent manufacture into bay rum furnish for the sister island of St. Thomas its only article of local manufacture and the most important of all its imports. Approximately 4,000 quarts of bay oil are produced in St. John annually, the greater part of which is sent to St. Thomas, from which it is estimated there is manufactured for export purposes about 60,000 cases of 12 quart bottles each of bay rum. The St. Thomas bay rum, which is considered the best on the market, is sent to all parts of the world. The greater part, however, is exported to Jamaica and Panama, whence it is transhipped to the countries on the West Coast of South America.

Although bay trees can be grown over the greater part of the island of St. John, only about 50 acres are devoted to its cultivation. The pickings of the first few years should yield about 25 lb. of leaves to a tree annually, but after the tree has reached its maturity, at least 100 lb. can be counted on, provided weather conditions are favourable. A bay tree reaches maturity when about ten years of age, and under ordinary circumstances will continue to bear leaves for fifty, sixty, and seventy years. According to the opinion of experienced growers, three pickings a year bring in the best yield, and create conditions that favour the superior quality of the leaf.

At present bay leaves sell for 1½c. per lb., but in normal times the price is 2c. The price of the oil ($4·50 per quart) is considerably less than that ordinarily received, and because of the slack market in St. Thomas, where the oil is usually sent, and the failure to find buyers abroad, large quantities of the leaves are being allowed to go to waste. The retail price of bay rum in St. Thomas is 25c. a quart. No Customs duty is levied on any article of export from these islands.

Exports of Lime Juice from Trinidad in 1915.—According to the *Perfumery and Essential Oil Record* (August 1916), the total exports of lime juice from Trinidad and Tobago amounted to 16,192 gallons, valued at £4,735, during the year 1915, as compared with 5,874 gallons valued at £2,655, in the preceding year. Exports of lime juice to the United Kingdom last year were valued at £4,038, and those to the United States at £603.

Green Manures and Germination.—The following note on this subject is taken from the *Experiment Station Record* (Vol. 35, No. 1):—

The results of a series of laboratory studies indicate that green manures may seriously injure the germination of certain seeds. This is believed to be brought about by the action of certain parasitic fungi, the development of which is favoured by the decomposition of the green manure plants. As a rule oil seeds are easily damaged, while starchy seeds on the contrary are quite resistant. Cotton seed and soy beans seem to be extremely sensitive to conditions resulting from green manuring, and the germination of flax, peanuts, hemp, mustard, and clover is reduced somewhat by the presence of decomposing plant tissue. The damage to oil seeds from green manuring seems to be confined largely to the first stages of decomposition, and experimental evidence seems to indicate that two weeks after green manure is added, it does not cause any injury to the seeds. Small applications of calcium carbonate seem to increase the injury to germination. The rate of germination was found to determine to a certain extent the degree of injury, slow germination being marked by a high percentage of diseased seedlings.

Auximones and Bacterized Peat.— Professor Bottomley's bacterized peat, referred to on several occasions in this Journal, is being independently investigated at the Rothamsted Experimental Station, and the results when published will prove an interesting comparison with the following obtained by Professor Bottomley himself and noted in the *Experiment Station Record* (Vol. 34, No. 4):—

In experiments to discover a bacterial test for plant-food accessories in soils (auximones) it was found that when the phosphotungstic acid extract from 1 gram of bacterized peat is added to a normal nitrifying culture solution inoculated with nitrifying organisms and the whole incubated at 26° C., a thick scum is formed on the surface of the liquid. Further tests showed that the scum is due to the presence and specific action of the auximone from the bacterized peat.

An examination of the scum showed that it consists of two predominant kinds of organisms, namely, a thin bead rod form and a spindle-shaped form. When grown separately in a nitrifying solution plus auximone, the scum did not appear. Tests of a number of soils, including loams, clays and gravels, showed that all yielded the scum, the best growth being obtained from a virgin loam. It was found that the rate of growth and thickness of the scum showed a progressive increase with the quantity of auximone present above a certain minimum. Tests of fresh and well-rotted stable manure showed that the quantity of auximone present increases with the progressive decomposition of the organic matter of the manure. Further results brought out by the experiments indicated that the organisms which form the scum require no organic carbon for their growth, and are similar to the nitrifying organisms and sulphur and iron bacteria in that they can assimilate atmospheric carbon dioxid by the process of chemosynthesis. They can not live on nitrates, but must obtain their nitrogen from an ammonium salt, and they are not destroyed by heating.

According to the Barbados *Weekly Illustrated*, the cotton factories in that island have been unable to obtain a regular supply of seed for making oil and cake from the neighbouring islands owing to the scarcity of schooners and sloops, and so they have sent a mariner to the United States to purchase a schooner which will be used principally in transporting cotton seed from the Northern Islands to Barbados.

METHODS OF MEASURING GROWTH IN THE SUGAR-CANE.

It was suggested in the last issue of this Journal that a useful purpose would be served if observations could be made concerning the rate of growth of the sugar-cane. Such observations would be valuable as an index of the effect of weather changes during the season's growth, and if carried on systematically over a number of seasons, we might obtain a clearer idea than is possessed at present, as to what is the ideal sequence of weather conditions for high yields and early maturity. From a practical point of view the observations would probably be of greatest use as a means of comparing accurately the growth of different varieties; the data might be expected to show to what extent weather conditions determine differences in yield apart from soil conditions and the constitutions of the different varieties.

A rough idea of the effect of weather changes can be obtained by examining a sugar-cane that is fully matured. In most cases it will be observed that the distances between the nodes or joints are not uniform; two or three may be close together, while at another point the length of the internode may be above the average. These differences are due to the effect of weather, principally rainfall. Taking a cane that has been grown under comparatively normal and uniform weather conditions, it should be possible to deduce with a fair degree of accuracy what the rate of growth has been. This can be done by dividing the number of joints into the number of weeks during which active growth has been in progress. Knowing the length of a joint we are then able to express the rate of growth in inches per week.

The direct measurement of the rate of growth in the sugar-cane is not an easy matter. Suggestions have been made from time to time but they present difficulties when attempts are made to put them into practice. The apical growing region is inaccessible for measurement purposes. The rate of growth in the different internodes varies from a maximum rate in the apical bud to zero in the mature internodes. It is not easy to decide, therefore, what method of measurement to adopt, particularly for comparative purposes.

One possible line of procedure is in connexion with rate of leaf development, or in other words, the rate of unfolding of the terminal bud. It should be possible to note at specified intervals of time the number of leaves that have unfolded, and this would no doubt be found proportional to the rate of growth. To what extent the development of the leaf and its period of functional activity is correlated with the development of the internode to which it is attached, is not definitely known. Probably the internode continues to grow after its leaf has ceased to function. Very few observations appear to have been made. Nor has the question of the period of functional activity of different leaves been enquired into. It would be interesting to know how long different cane leaves function. The period is probably dependent upon moisture conditions.

To come back to the main point of measuring cane development, a method that possesses practical possibilities is the following. Suppose one wishes to compare the rate of growth in, say, six different canes. Select in each case a not fully developed internode nearest to the surface of the soil, in a very young plant or, say, 1 foot above the surface in an older plant. Measure the distance between the two nodes by means of a pair of dividers and record the measurement in tabular form as shown above. In order to expose the nodes, it will probably be found necessary to cut a slit in the enveloping leaf-sheath. Repeat the observation at the end of every week. As well as the first internode just referred to, the one above together with all that may be accessible may also be measured, and the figures recorded in the same way. In subsequent weeks, as the cane grows, still other internodes may be measured, and at the end of two or three months a set of observations will have been obtained and recorded after the manner indicated by a few hypothetical cases shown below.

Internode	Weeks. 1	2	3	4	5	6	7	8	9	10
10										
9										
8										
7										·5
6								·5	1·5	2·5
5						·5	1	1·5	2	2·5
4				·5	1	1·5	2	2	3	3
3		·5	2	2·5	3	3	4	4	5	5
2	·5	1	2	3	4	4	4	5	5	5
1	1·5	2	3	4	4	5	5	5	5	5

These results should show the rate of expansion of the particular area under observation in each cane. They would also indicate the time when growth ceases in any one node, and possibly bring out some of the adverse effects of unfavourable weather.

It will be understood that the methods suggested are only put forward tentatively with a view to their being tested as to their practicability. Others will no doubt suggest themselves to the plant observer interested in the matter.

We may now turn from the stem growth to root growth. To measure root growth in the cane plant is practically impossible, but there are certain aspects of root development that will allow of useful observations being made. Varieties differ in regard to the extent of their root system. Presumably varieties characterized by having a large number of canes to the stool and hence an extensive rhizome below the soil, will have a wider root range than plants with a few canes to the stool. Varieties with extensive root systems may be expected to make unusually heavy demands upon the immediately available water-supply in the surface soil, and such varieties might be expected to be susceptible to even short periods of dry weather. Actual observation shows this to be the case in regard to the well-known variety B.1753. As far as we know, there have been but few observations made in connexion with the relative root range in different varieties. The matter is important and should receive the attention of those engaged in experiments with sugar-cane.

In concluding, it ought to be more definitely stated, that the principal object in making the observations suggested above is to determine as far as possible the influence of weather conditions upon growth, and to find out to what extent the constitution of certain varieties renders them less susceptible than others. To achieve this end careful

meteorological observations are required, and as this condition is fulfilled at all the experiment stations in the West Indies, it may be expected that at those where the sugar-cane is grown, preliminary observations will be instituted in regard to the growth and development of that plant.

THE SUGAR-CANE CROP IN BARBADOS.

In connexion with the note published in this issue reviewing the weather conditions and crop prospects in Antigua and St. Kitts, the following extract from an article in the Barbados *Agricultural Reporter* will be read with interest:—

The rainfall in Barbados for September was somewhat irregular. The month opened propitiously, and for the first week there was a rainfall of about 2 inches. After this there were fifteen consecutive days of dry weather with very hot suns, during which time vegetation began to feel the lack of moisture. It seems that at this time of the year the earth grows dry more quickly than during a dry spell in the earlier months. A very welcome change came on on the 26th, and from the 27th to the last day of the month there was an average rainfall of 3 inches.

As far as we have been able to ascertain, no part of the island has recorded less than 5 inches for the month of September. This, following on the large number of wet days in August, would have been sufficient for the growth of every crop if it had been well distributed.

The leeward parishes recorded more rain during September than did the parishes situated in the central, eastern and southern parts of the island. At District 'E', the rainfall was 8·71 inches, and at Holetown it was 7·95.

October so far (up to the 7 inst.) has been dry. The sky has been very clear and the sun very hot. Rain is again needed in order that there may be no check in the growth of the crops to be reaped in 1917. It is also required to enable the planters to proceed steadily with the preparation of their fields for the planting season which is but eight weeks off, and in some districts only six weeks.

The dry days during September were very helpful in assisting planters to get rid of weeds and grass both in the preparation land and in the fields where the canes have not yet covered the ground. There is still, however, a good deal of weeding to be done before it can be said that the land for the coming planting season presents that appearance which is so desirable.

The fields have practically all been ploughed or forked, but there is still some cane-hole digging to be done, and a few of the planters tell us that they are somewhat backward with this work. On the whole, however, there is no need for anxiety, although in some districts the demand for labour exceeds the supply.

Turning to other topics, the article in due course refers to the question of manuring. As much pen manure as possible, and sheep manure at the rate of 2 tons per acre have been applied on many estates. As regards the storage of pen manure, the article says:—

Of recent years several estates have erected spacious and well-covered pens, but there are still a large number of estates where very inferior structures are used. Advantage should be taken of the present good prices not only to improve machinery, but to effect every necessary improvement. A good deal is being done for the improvement of the sugar manufacture. It is as important to pay the utmost attention to everything that will improve the yield in the field.

We have noticed on one or two estates that some pasture land is being broken up and will be put under canes for the crop of 1918. This is expensive work, but with the prospective high prices for the next two or three years, it is expected that the return will justify the outlay. Pasture land is, however, a very valuable asset to an estate, and the reduction of it should not be lightly decided on.

As regards the shipment of this year's crop, it is stated:—

The exportation of sugar and molasses still continues. During the fortnight ended September 28, 801 tons sugar and 2,077 puncheons molasses were shipped. This brings the total shipment of this year's crop up to 47,148 tons sugar and 84,844 puncheons molasses, as compared with 26,571 tons sugar and 53,235 puncheons molasses at the corresponding period of last year.

In conclusion it may be stated that with a continuation of rains in November and December, next year's crop promises to be a record one in yield per acre, and this, together with the fact that there is some extension in the acreage under canes and every prospect of high prices, the position of the Barbados planter is an exceedingly good one.

Prophesying the Life Duration of Seeds.—A note appears in the *International Review of the Science and Practice of Agriculture* for March 1916, on a method of prophesying the life duration of seeds. The writers suggest that the viability of seeds decreases with rise of temperature and moisture content of the seed, and that it is due to the slow coagulation of the proteins of the plasma of the embryo. The time temperature formula for the coagulation of protein: $T = a - b \log Z$, in which T = temperature, Z = time in minutes, and a and b are constants, has been found applicable as a temperature life duration formula for seeds.

The Yearbook for 1915 of the United States Department of Agriculture contains an interesting article on the production and handling of grain in Argentina. This is of particular interest in connexion with the editorial in this issue of the *Agricultural News*. Notwithstanding the fact that about 70 per cent. of the corn grown in the world is produced in the United States, the surplus for export has decreased in recent years to such an extent as to permit importations of this cereal. These importations have been made chiefly from Argentina, which is the principal corn-surplus-producing country of the world. It is considered likely that Argentina will continue to send corn to the United States, especially in years of decreased production. This together with the fact that Argentina is taking a place of ever increasing importance in the production of grain, chiefly wheat, for export to the European markets, makes a discussion such as the one in the article referred to of considerable interest and importance.

MARKET REPORTS.

London.—The West India Committee Circular, September 21, 1916.

Arrowroot—No quotations.
Balata—Sheet, 3/3; block, 2/2½ to 2/10.
Beeswax—No quotations.
Cacao—Trinidad, 84/- to 85/-; Grenada, 73/- to 80/-; Jamaica, 82/6.
Coffee—Jamaica, no quotations.
Copra—£31.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 82/- to 120/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/3; concentrated, £27; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—8*d.* to 2*s.* 8*d.*
Nutmegs—10*d.* to 1*s.* 2*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 3*s.* 3½*d.*; fine soft, 3/-; Castilloa, no quotations.
Rum—Jamaica, 5/6 to 5/7-.

New York.—Messrs. Gillespie Bros. & Co., September 16, 1916.

Cacao—Caracas, 16¼c. to 16½c.; Grenada, 15¾c. to 16c.; Trinidad, 16c. to 16¼c.; Jamaica, 13¼c. to 14c.
Coco-nuts—Jamaica and Trinidad selects, $42·00 to $45·00; culls, $23·00 to $25·00.
Coffee—Jamaica, 10c. to 12c. per lb.
Ginger—15c. to 18c. per lb.
Goat Skins—Jamaica, 62½c.; Antigua and Barbados, 60c. to 62c.; St. Thomas and St. Kitts, 58c. to 61c. per lb.
Grape Fruit—Jamaica, $3·75 to $5·00.
Limes—$3·75 to $4·50.
Mace—47c. to 52c. per lb.
Nutmegs—17c.
Oranges—Jamaica, $3·50 to $4·75.
Pimento—5c. per lb.
Sugar—Centrifugals, 96°, 5·52c; Muscovados, 89°, 4·77c.; Molasses, 89°, 4·645c. all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 21, 1916.

Cacao—Venezuelan, $15·75 to $16·00; Trinidad, $16·00 to $16·25.
Coco-nut Oil—$1·18 per Imperial gallon.
Coffee—Venezuelan, 13½c. to 14c.
Copra—$5·25 per 100 lb.
Dhal—$7·00 to $7·25.
Onions—$3·50 to $4·00 per 100 lb.
Peas, Split—$11·50 per bag.
Potatoes—English $2·75 to $3·00 per 100 lb.
Rice—Yellow, $7·50 to $7·75; White, $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 4, 1916; T. S. Garraway & Co., October 2, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·50 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $4·50.
Peas, Split—$9·65 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·57 to $6·50.
Rice—Ballam, $7·35 to $7·45; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·60 to $5·00.

British Guiana.—Messrs. Wieting & Richter, September 30, 1916; Messrs. Sandbach, Parker & Co.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	
Balata—Venezuela block	——	
Demerara sheet	$65·00	
Cacao—Native	12c. per lb.	
Cassava Starch—	——	
Coco-nuts—	$20 to $24 per M.	
Coffee—Creole	14c.	
Jamaica and Rio	15c. per lb.	
Liberian	11c.	
Dhal—	$7·00	
Green Dhal	——	
Eddoes—	$1·20	
Molasses—Yellow	None	
Onions—Teneriffe	2½c.	
Madeira	4c.	
Peas—Split	$12·00 to $12·50	
Marseilles	——	
Plantains—	24c. to 48c.	
Potatoes—Nova Scotia	$4·00 to $4·50	
Lisbon	——	
Potatoes—Sweet, B'bados	$2·40	
Rice—Ballam	$6·00 to $6·50	
Creole	——	
Tannias—	$1·44	
Yams—White	$2·64	
Buck	$3·12	
Sugar—Dark crystals	$4·50 to $4·75	
Yellow	$5·00 to $5·10	
White	——	
Molasses	——	
Timber—Greenheart	48c. to 72c. per cub. foot	
Wallaba shingles	$4·75 to $6·75 per M.	
,, Cordwood	$2·00 to $2·40 per ton	

NO QUOTATIONS.

AGRICULTURAL NEWS.

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The Experiment Station Worker.

A FEW years ago, when visiting some of the Agricultural Experiment Stations in the United States, a distinguished agricultural scientist from England was impressed more than anything else with the energy and ability with which the American Experiment Station workers get over the farmers' difficulties. In some instances the results of research were considered open to criticism; but the energetic methods of attacking and getting over, or else around the farmer's practical problems were viewed with unqualified admiration.

Something of the spirit and atmosphere dominating this work is well brought out in an editorial in the *Experiment Station Record,** issued by the States Relations Service of the United States Department. The article describes the thoughts and impressions produced during an official tour of inspection, in the States of the South and West.

'No one can come into personal contact with the station workers on the field of their activity without being impressed with their zeal and industry. They are an unusually busy group of men, keen and alert, and with a zealous interest in the problems of the region which is blind to personal hardship or self-sacrifice. There is something remarkably fine in the spirit of the service, of accomplishment, which ties these men to their field, particularly in the newer country where the appeal seems especially strong.'

Accompanying the investigation and extension work of the service is a considerable amount of teaching, and the article goes on to say that workers often find themselves loaded with more work than they can prosecute as they would like to, and are led by their enthusiasm to work under unusually high pressure. In such cases workers need protection from themselves and their friends.

Sometimes station workers need protection in other directions, namely, against unfair critics and unknowing or self-seeking factions. A hostile attitude is sometimes directed against the station as an organization, but more often against an individual member, especially the director. Fortunately, it is added, the position of director has been almost entirely divorced

* Vol. 35, No. 1, July 1916.

from politics and from personal influence, and is now usually based upon merit and ability alone.

As regards the nature and extent of the work accomplished, the article says: 'The great range and variety of it are well nigh bewildering—from such unusual subjects as the ostrich and the date and the cactus in Arizona, the citrus, avocado, and wine and grapes in California, the range problem in Nevada, the alkali and irrigation studies of other sections, and the problems of dry farming, to the more familiar ones of grain and stock farming in the humid sections. . . . . Whether the work deals with practical economic experiments in the culture of plants and the feeding of animals, the study of the principles of breeding them, the activities of the lesser forms of life that inhabit the soil, or the ravages of an insect or a plant disease, the final aim is control—dominion over the soil, the growing things, the elements, and where control and dominance are not feasible, the effort is no less direct to avoid or overcome the obstacles by adaptation, or by finding some means of getting around them.'

These fine aims cannot be attained, however, without physical equipment and financial support, as we appreciate only too fully in the West Indies. The article under notice says the increase in physical equipment and in financial support of the stations in the Western and Southern States makes a deep impression on the casual visitor, particularly since only a few years ago the money provided was inadequate. Now in accord with present needs progressive State Governments have furnished large appropriations. Texas alone spends on its experiment stations £30,000 annually, the capital needed for their establishment in the first instance being of course vastly greater. As regards California, the article says: 'We have learned to expect large things of California, but the extent to which it is meeting the needs of its varied agriculture, from the tropical region of the Imperial Valley to the northernmost part of the State, leaves no doubt of the place the station work has made for itself in that State. A citrus station is being developed in the southern end which will be unequalled in the world, with opportunity for investigation and advanced study over the whole range of sub-tropical agriculture. The new tract of 475 acres at Riverside recently purchased for this station at a cost of $55,000 is now being made ready, and the plans have been approved for buildings to be erected with a $125,000 appropriation. At Berkeley a $360,000 addition to the large agricultural building erected a few years ago is planned for, to relieve the crowded condition of nearly all the agricultural departments.'

All these facts will appeal very strongly to workers in the West Indies. The singular parallelism between the circumstances of experiment station work in the States and these islands—with the one and very regrettable exception of financial support—will be readily apparent. The various lines of activity at the different West Indian Stations have increased very considerably of recent years. These new lines of activity, however, while putting greater strain on the workers, have not to anything like a corresponding extent led to demands being made upon the resources of the local treasuries. There are at least four local agricultural departments in the West Indies which are understaffed: yet inspection of the annual reports of recent years will show that new lines of work have steadily been introduced, while the routine and experimental work of former years is being satisfactorily continued. This puts great credit on the workers, and the remarks quoted at the beginning of this article as regards the United States are not inapplicable in the case of Experiment Station workers in the West Indies.

The principal deficiency in the West Indian agricultural service appears to lie in the direction of two extremes. The experiment station work itself is on a satisfactory footing: the deficiency lies in the lack of scientific research on the one hand, and inadequate extension work on the other. The experiment stations require more scientific support. This was well brought out in regard to cotton at the Conference held at St. Kitts last March. They need also the provision of better educational facilities for bringing results to the notice of the planting community, and for seeing that the results actually find their way into practice. The recent move in the direction of extending the work of peasant instruction is a hopeful sign that the inadequacy of extension work is being appreciated. There are signs also that the future may see increased provision for scientific research in the West Indies, but the unsettled circumstances attendant on the war do not make any definite statement possible. It is something, however, to know that the so-called 'need' for more research in the West Indies is gradually being seen in official circles to mean, not need, but necessity.

THE VIRGIN ISLANDS HURRICANE.

Detailed reports have now come to hand in regard to the cyclonic weather experienced in the Leeward Islands and also, with disastrous results, in the Virgin Islands, between the dates of October 7 and 10 of this year.

Very commendable observations were made in the Virgin Islands at Tortola by Mr. W. C. Fishlock, Curator of the Experiment Station, under the trying and dangerous conditions of the storm In Antigua and St. Kitts, Dr. H. A. Tempany and Mr. F. R. Shepherd also made careful note of changes in progress.

VIRGIN ISLANDS (TORTOLA).

METEOROLOGICAL OBSERVATIONS. *Sunday, October 8:* No indications of approaching bad weather. Wind south of east blowing steadily. During night, wind freshened and about 4 a.m. was blowing quite strong from about south-east. Barometer somewhat low (29·90 at 8 a.m. on Monday). *Monday, 9th:* Towards mid-day wind increased somewhat, clouds flying due west. Heavy rain in the afternoon, barometer steady at about 29·80. Between 4 and 5 p.m. the sky became very overcast, heavy rain fell and wind increased in force but was still south of east. This indicated that the centre of a storm was passing south as the barometer showed no tendency to fall At about 6 p.m., however, the barometer commenced to fall rapidly and steadily, and by 7 p.m. the wind was very violent, the first trees beginning to fall about this time. Wind blew with its greatest violence between 8 and 9 p.m with a velocity estimated to be over 100 miles per hour. Barometer rose slightly soon after 9 p.m. but there was no period of calm. It was therefore assumed that the centre passed to the south or west of Tortola, and was either breaking up into two storms or changing its track. The barometer rose very slowly and the wind blew in fierce gusts from south, south-west and west till about 3 a.m. on the 10th. The lowest reading that the barometer recorded was 28·80 at 8.50 p m. on the 9th.

EFFECTS OF THE STORM. The most remarkable feature regarding the hurricane was that it came on unexpectedly, there being none of the usual indications. In Tortola the destruction of life and property has been great, twenty-one deaths and fully 100 cases of injury being reported for Tortola alone. The destruction of dwelling houses was very great and a large number of the inhabitants were left homeless. Most of the cultivations were devastated and the cotton crop has been entirely lost. The Federal Government of the Leeward Islands has taken active relief measures, assisted by the Imperial Department of Agriculture.

VIRGIN ISLANDS (ST. THOMAS.)

The first signs of the hurricane were shown by rough seas and a falling barometer on October 7. On the 9th, in the Danish Islands, the barometer was falling rapidly with heavy squalls from the north-east, and by the afternoon the glass was as low as 28 02. The wind increased in intensity until between 7 and 8 p.m. when there was a lull. After about an hour, the wind blew with redoubled strength from the west and later from the south, accompanied with a deluge of rain. The damage to house property in St. Thomas is reported to be very great, and the shipping also suffered to a very great extent. The damage in the neighbouring island of St. Croix, which is of greater agricultural importance, is estimated at about $1,000,000.

ANTIGUA.

In Antigua evidence of disturbed weather conditions was visible from early Saturday morning, October 7, at which time at 10 a.m. the barometer reading was 29·94. Wind direction was east all the morning and back round to south-east by the afternoon. Fall of the barometer was very slow, and it was inferred that a disturbance had passed to the south of the island *Sunday, October 8:* About 9 to 10 o'clock the wind which had been southerly to south-easterly all night backed up to the east and the barometer started to fall once more. After having moved up to the east the wind moved suddenly again and remained in that quarter for the remainder of the time *Monday, October 9:* Barometer remained very low with strong south-easterly wind and heavy sea; the lowest reading obtained was in the afternoon at 3 p.m. when it touched 29·79. It appears from these observations that there were two distinct disturbances, one of which passed south of Antigua on Saturday night and the other on Sunday night, both following the same track.

ST. KITTS-NEVIS.

Saturday, October 7: Barometer was low (29·85) in the afternoon, with a north-east wind. *Sunday, 8th:* The wind blew from south to south-west and it was inferred that a storm had passed. On Sunday evening the wind again went to north-east and kept in that direction all night. *Monday, 9th:* In the morning the wind went to south-east and blew a strong breeze all day from that direction. The lowest barometer reading was 29·75 on Monday at 3 p.m.

As in the case of Dominica, St. Kitts-Nevis suffered not from the effects of high winds during these disturbances but from heavy seas. Newly planted coco-nuts were washed away in Nevis, and in both of these islands cotton along the coast was blasted.

GENERAL INFERENCE.

It would appear from these observations, including those recorded at St. Thomas over which island the centre of a hurricane passed, that there were two distinct storm areas. They probably passed south of Antigua moving fairly slowly in a north-westerly direction, but rapidly increasing in intensity. The conditions observed at Tortola were probably due to the progress of the second cyclone being retarded by the presence of the first: the second cyclone may even have been forced somewhat eastward for a time These conditions would cause the movement of the centre of the second cyclone to be very slow: this is borne out by the statement that the unusually long period of an hour and a half was occupied in the central calm passing over St. Thomas.

Last Season's Weather Conditions in St. Kitts.—In addition to what was published on this subject in the last issue of the *Agricultural News*, the fact may be added that in one respect the weather was not entirely favourable. On the northern side of the island the heavier rainfall affected the working of the muscovado estates, and with one exception they were unable to finish reaping by the end of July, and some have had to leave cane standing over to reap in November. This delay was caused from the lack of fuel, since the constant showers interfered with the drying of the megass. As already noted, under the conditions existing at the Central Factory, the weather for the season under review was most favourable. This fact is of interest as showing another weak point in the small muscovado plant, namely its complete dependence upon weather conditions.

REVIEW OF THE WORK OF THE ANTIGUA AND ST. KITTS CENTRAL FACTORIES, 1916.

By the courtesy of the Directors of Gunthorpes Factory. Antigua, and of Basseterre Factory, St. Kitts, the Commissioner of Agriculture has been furnished with the detailed account of the factories' work for the crop of 1916.

The Antigua Factory made 12,372 tons of sugar (96° grey crystals) from 112,356 tons of canes, or 1 ton of sugar from 9·07 tons of canes.

The St. Kitts Factory made 11,591 tons of sugar from 101,248 tons of canes, or 1 ton of sugar from 8·74 tons of canes.

The main features of the factories' work may be gathered from the following table:—

TABLE I.

	Gunthorpes, Antigua.	Basseterre, St. Kitts.
Cane crushed tons	112,356	101,248
Juice (diluted) tons	98,299	98,376
Juice undiluted) tons	82,040	78,682
Juice per 100 cane	73·0	77·7
Juice expressed per 100 parts of juice in cane	92·2	89·7
Purity diluted juice	83·9	84·7
Sucrose in 100 cane	12·53	12·84
Fibre in 100 cane	16·24	13·25
Sucrose per 100 parts megass	3·01	2·99
Juice in megass per 100 fibre	38·0	40·2
Recovery commercial sugar on indicated sucrose in juice	95·35	95·19
Recovery sucrose on the indicated sucrose in juice	91·60	91·48
96° sugar made per 100 sucrose in cane	87·95	89·27
Sucrose in above per 100 sucrose in cane	84·48	85·59

The summary of the recovery and losses of sucrose involved in the work of the season is as follows:—

For Antigua:—

	Per 100 cane.	Per 100 sucrose in cane.
Sucrose in sugar	10·580	84·48
„ lost in megass	·975	7·78
„ „ „ scums	·048	·39
„ „ „ molasses	·872	6·92
„ „ unrecorded	·051	·43
	12·526	100·00

For the Basseterre Factory the figures are:—

	Per 100 cane.	Per 100 sucrose in cane.
Sucrose in sugar	11·00	85·59
„ lost in megass	·89	6·95
„ „ „ scums	·06	·47
„ „ „ molasses and unaccounted for	·89	6·99
	12·84	100·00

The average composition of the cane dealt with at the two factories as calculated from the analytical data obtained in the general working was—

	Antigua.	St. Kitts.
Sucrose	12·52	12·84
Glucose	·87	·77
Non-sugar	1·53	1·55
Fibre	16·24	13·25
Water	68·84	71·59
	100·00	100·00

On crushing, the canes were spilt up into juice and megass as below:—

		Antigua.	St. Kitts.
Juice.	Sucrose	11·55	12·02
	Glucose	·80	·72
	N. sugar	1·41	1·45
	Water	59·28—73·04	63·54—77·73
Megass.	Sucrose	·97	·82
	Glucose	·06	·05
	N. sugar	·13	·10
	Fibre	16·24	13·25
	Water of juice	5·00	4·34
	Structural water	4·56—26·96	3·71—22·27
		100·00—100·00	100·00—100·00

The megass as it came from the mill had the following composition:—

	Antigua.	St. Kitts.
Sucrose	3·01	2·99
Fibre	50·18	48·09
Water	45·65	47·87

From the data available, it is possible to recalculate the composition of the megass as follows:—

Fibre	50·18		48·09	
Juice	19·05	83·28	19·33	80·87
Structural water	14·05		13·45	
Maceration water	16·72	16·72	19·13	19·13
	100·00		100·00	

It is thus seen that 100 parts of megass coming from the mill contained at Antigua 16·72 parts of residual maceration water and 83·28 of the true megass, while at St. Kitts the figures are 80·87 and 19·13, respectively. It is of interest and importance to note the amount of maceration water which the megass contains, for it follows that the weight of the wet megass coming from the mill is in excess of the figure obtained by deducting the weight of juice expressed, from 100. It was 32·4 for Antigua and 27·5 for St. Kitts, against 27·0 and 22·3, the figures obtained by subtraction.

The total quantity of maceration water carried away in the megass at Antigua was 6,094 tons or 5·41 per cent. of the weight of the cane; at St. Kitts the quantities were 5,203 tons or 5·27 per cent. of the weight of the cane.

Generally considering the statements put forward, attention may be drawn to the relative composition of the cane dealt with in the two factories. That at Antigua contains somewhat less sucrose and considerably more fibre, the proportion of fibre in the Antigua cane being 122·6 for every 100 in the St. Kitts cane, with proportionate increase in the difficulty of milling.

The work of the mills has been extremely good, the work being very similar at the two factories when judged on the basis of mill efficiency notwithstanding the difference in the nature of the cane dealt with.

The amount of juice lost in the megass per 100 of fibre was 38·0 at Antigua, and 40·2 at St. Kitts, a small difference that only requires the expression of 0·3 per cent. more juice from the St. Kitts cane to equalize.

The Antigua mills extracted 92·2 per cent. of the juice present in the canes, and the St. Kitts mills 93·6, the weight of juice expressed being at Antigua 73·1 per cent., and at St. Kitts 77·1 per cent. of the weight of canes.

The megass as analysed contained at Antigua 3·01 and at St. Kitts 2·99 per cent. of sucrose. These quantities are very low; they were obtained by good milling accompanied by the use of 19·88 parts of maceration water per 100 of cane at Antigua, and 24·62 at St. Kitts; in both these cases account is taken of the quantity of maceration water retained by the megass, the proportion of water employed per 100 fibre being 97·2 at Antigua and 185·8 at St. Kitts.

It is satisfactory to note that owing to the improvements effected in connexion with the furnaces, the sugar was manufactured practically without the use of fuel other than megass; 45 tons of wood being used in all at Antigua, and 86 tons at St. Kitts together with 5½ tons of crude petroleum.

The work of manufacturing the sugar from the juice has also been satisfactory.

The amount of commercial sugar made (grey crystals) was at Antigua equivalent to 95·35 per cent. of the sugar in the juice, and 95·19 at St. Kitts. These recoveries are remarkably good: they compare very favourably with the work done in first class factories in other parts of the world. Reckoned in terms of sucrose they show a recovery of 91·58 per cent. of sucrose at the former factory, and 91·39 at the latter.

The losses in various stages of manufacture are recorded above: it may be of interest, however, to record that the quantity of filter-press cake at Antigua was 1,551 tons or equal to 12·5 per cent. of the weight of the sugar made, or 1·37 per cent. of the weight of the cane. It contained 3·6 per cent. of sucrose.

The weight of filter-press cake made at St. Kitts is not recorded; it is, however, stated to contain 6·2 per cent. of sucrose.

The progress that has been made in increasing the efficiency of Gunthorpes Factory may be judged from the increased recovery of sugar from the sucrose in the cane as shown in the statement below:—

	Tons of cane to make 1 ton sugar.	Recovery on 100 sucrose in cane, as commercial sugar.	Recovery on 100 sucrose in cane, as sucrose.
1905	9·70	67·41	64·74
1906	10·51	67·51	64·56
1907	9·64	72·18	69·36
1908	9·17	76·70	73 68
1909	9·33	75·39	72·48
1910	8·96	76·10	73·19
1911	10·07	70·46	67·62
1912	9·51	73·86	70·95
1913	9·58	80·86	77·63
1914	9·09	81 67	78·33
1915	9·71	85·77	82·60
1916	9·07	87·95	84·48

From the foregoing statements it will be seen that the work of the two factories is remarkably similar in character, both as regards the efficiency of the mills and the recovery of the sugar from the juice: in each respect the work done is of a very high order, closely approaching what is economically possible. The reproach of inefficient machinery and obsolete processes of manufacture may therefore be held to be effectively removed from the districts in which these factories are operating.

F.W.

Sugar-cane Wax.—According to Clacher (*International Sugar Journal*, 1916, 18, 23), a number of factories in Natal extract the wax from sugar-cane press-cake by means of benzene. The dry press-cake commonly contains 14 per cent., and sometimes as much as 17 per cent., of wax, which is a larger proportion than is present in the press-cake of most other sugar-growing countries. The cane chiefly grown in Natal is the Uba variety.

Experiments in Mauritius (Memorandum of Director of Agriculture, Mauritius, June 1915) show that the percentage of wax in the dry press-cake varies considerably, viz. from 1·8 to 16·8 per cent., although in most cases 10 per cent. or more is found; it appears that seedling canes give higher yields of wax than Tanna varieties, and that virgin cane is richer in wax than ratoons. It appears that the wax is now being prepared on a larger scale, and that further plant for its extraction is being erected in Natal. (*Bulletin of the Imperial Institute*, Vol. XIV, No. 2, April-June 1916.)

West Indian Turtles.—A report of considerable value and interest appears in the Meddelelser fra Kommissionen for Havundersogelser on 'Marking Experiments with Turtles in the Danish West Indies,' by Dr. Jos Schmidt. Four species are found in this area—the leathery, loggerhead, hawksbill, and green turtles,—and the author gives a brief but extremely useful summary of their breeding habits, supplemented by some excellent figures of newly hatched specimens of each species. The leathery turtle and the loggerhead have no great commercial value, but their eggs are taken in large numbers. The green turtle, however, for its meat, and the hawksbill for the sake of its horny shields, which form the 'tortoise shell' of commerce, are subjected to a heavy toll, young and adults alike being taken. The green turtle is happily enabled to lessen the strain of this persecution in that it lays it eggs so near the margin of the sea that all traces of their whereabouts are obliterated by the wash of the tide (*Nature*, August 31, 1916.)

DEPARTMENT NEWS.

Information has been received to the effect that Dr. H. A. Tempany, Government Chemist and Superintendent of Agriculture for the Leeward Islands, has been offered and has accepted the post of Director of Agriculture, Mauritius, in succession to Mr. F. A. Stockdale, M.A., who has been promoted to Ceylon.

WORK OF THE AGRICULTURAL DEPARTMENT IN GRENADA.

The periodical progress report on the work of the Agricultural Department, Grenada, for the quarter ended September 30, 1916, has been received, and the chief points of interest are embodied in the following notes.

In regard to agricultural instruction and inspection in the country districts an estate at Carriacou was inspected in connexion with a proposed land settlement scheme. A lecture was given at St. David's having special reference to drainage, while four schools in St. David's were visited in connexion with nature teaching work. Instruction in lime planting and the spraying of lime and coco-nuts was the reason for several visits to various estates.

The work of the Agricultural Instructors has taken them to all the parishes of the island and to Carriacou. The peasants on a large number of holdings entered in the Prize Holdings Competition have been instructed, and the subsequent judging has been ably carried out by the instructors. During the quarter 587 peasants' holdings, nine estates, and eight schools were visited by the instructors.

Work in the Botanic Gardens has included, as well as routine matters, operations and events of particular interest. A small plot of *Carum copticum* (Ajowan) has been established, while the following economic plants have been planted out in permanent places for trial: *Vitus vinifera*, var. Foster's seedling, five *Coffea robusta*, one *Morus alba*, and four each of the common, Indian white, Indian red, and pear-shaped guavas.

In the nurseries a number of budded citrus and mangoes will soon be ready for distribution. Lime seeds have been obtained from the St. Lucia Government Lime Juice Factory for raisng the next year's crop of plants for distribution, and sowing is in progress.

In the experiment stations, it is stated that at the lime station in St. George's the progress of the lime trees, is on the whole, satisfactory The trees planted through a section of the field that was under Guinea grass have not kept pace with those in other parts of the field, and it will be necessary to root out this grass. At St. Cyr the limes in the section are doing well, and though only thirteen months old, some of them are already 8 feet high. The experimental cultivation of bush Lima beans and red beans has been continued. At Westerhall, the $\frac{1}{4}$-acre lime plot has been extended to 1 acre. Horse beans are being grown as a cover, and for seed distribution purposes. Other crops which are being grown on trial, and to supply material for distribution, are pigeon peas, yams, eddoes, and various kinds of beans. Monthly sowings of bush Lima beans are being made to ascertain which period is most suitable for their development. The coco-nut trees at this station are stated to be in good condition, but considerable trouble with this crop has been experienced at Morne Rouge in connexion with scale insect attacks.

For the last year or two it has been the policy of the Department to push lime planting in Grenada amongst the peasantry. A large number of plants distributed from the nurseries indicate that considerable progress has been made. At the same time the peasants are not encouraged to plant limes to the exclusion of provision crops, of which there is already a dearth. At the present time when the price of foodstuffs and the general cost of living is so high and is likely to increase, the cultivation of provision crops is to be strongly advocated, not only in Grenada but in all the West Indian islands.

Details are given in the report under review in regard to plant distribution, which was as follows: 18,543 limes, 1,841 coco-nuts, 280 cacao, 230 shade trees, 200 pine-apple suckers, 6 budded oranges, 4 grafted mangoes, and 144 various, besides some 300 lb. of seed. This distribution is not regarded as being quite up to the standard for similar periods of previous years.

THE EFFECT OF MULCHING ON LIME TREES.

Some interesting observations appear in the Report of the Agricultural Department, Grenada, 1915-16, regarding the mulching of lime trees at one of the Experiment Stations.

The lime plot is $\frac{1}{4}$-acre in area, and the trees, which were planted in 1911, are 15 feet apart. The plot is equally divided into two sections: mulched and unmulched.

There is no record of the quantity of mulching material that has been applied to the mulched section, but in November 1914, a thick covering of about 10 inches in depth of partly decayed mulch was observed. At intervals since then, bush and grass sufficient to keep the land well protected from the sun have been applied.

The contrast in the development and vigour of the trees in the two sections is very marked, and unmistakably demonstrates the value of mulching as a means of accelerating the vigorous growth of lime trees in a district where the rainfall is estimated to approximate 45 inches per annum.

While the trees must have derived considerable benefit in the dry seasons, as the result of the water-conserving properties of the mulch, it is from the plant food provided by the organic matter thus supplied that they probably have derived the greatest benefit.

Measurements of the trees were taken in October with the following results:—

No.	Trees in mulched plot. Height in feet.	Diameter in feet.	No.	Trees in unmulched plot. Height in feet.	Diameter in feet.
1	8	10	1	9	9
2	9	12	2	7	8
3	6	10	3	8	8
4	8	9	4	10	9
5	9	10	5	7	8
6	11	10	6	7	7
7	10·5	14	7	9	10
8	11	15	8	9	9
9	10	15	9	8	7
10	11	15	10	8	9
11	9·5	15	11	7	6
12	6·5	9	12	8	7
13	10·5	15	13	9	8
14	10	10	14	8	7
15	9	12	15	5	6
16	8·5	14			
17	9	15			
18	8	11			
Average	9·2	12·3		7·9	7·9

In round figures, the average dimensions of the trees in the respective sections may be taken at 9 feet × 12 feet, and 8 feet × 8 feet. If for purposes of comparison it is assumed that the outer surface of the trees approximates a dome shape, the average dimensions of the trees in the respective plots indicate that the superficial area of fruiting surface per treee on the mulched section is 178 sq. feet as against 100 sq. feet per tree on the unmulched section, representing a gain of 78 per cent. per tree to the credit of the mulched section.

THE PREPARATION OF COMMERCIAL PAPAIN.

Recent enquiries concerning the production of papain have made it desirable to reproduce the following article which first appeared in the *Agricultural News*, Vol. I, No. 1:—

The preparation of crude papain is a comparatively easy matter, provided that attention is paid to certain matters of detail.

COLLECTING THE MILK.

The juice, or milk, which forms the starting point is procured by making a scratch or shallow incision in the skin of the fruit of the papaw while in a green condition. It is desirable to employ a bone or wooden knife, like a paper-knife, for the purpose. The milky fluid rapidly exudes and may be caught in a cup held beneath the fruit. After a time the flow diminishes and the liquid coagulates in the neighbourhood of the incision: this is carefully removed by means of the bone or wooden knife and placed in the cup with the milk already collected. The fruit is not removed from the tree, and it may be subjected to the operation of tapping several times at intervals of two or three days.

It is essential that no iron knife, or iron utensils, should be brought into contact with the milk. Wood or bone should be employed, and the milk should be collected in earthenware basins or cups, or in glass vessels, and not in tins, which are sure to blacken it.

After collecting, the juice soon becomes coagulated and then should be in the form of a snow-white curd, possessing a somewhat pungent, but not putrid, smell. It speedily decomposes if not rapidly dried, and, when decomposing, emits a most unpleasant odour. It is necessary then that drying should be effected as speedily as possible. When considerable quantities are being prepared, the collection of the juice or milk should be undertaken in the early morning, and the drying should begin before mid-day. This ensures that by evening the material is in a sufficiently dry condition to keep without deterioration until the following morning when the drying can be completed.

DRYING THE MILK.

The drying may be effected in several ways. In dry, hot weather the coagulated milk may be placed in thin layers on sheets of glass and exposed to the sun. This, however, is rarely satisfactory on a large scale, and it is best to adopt

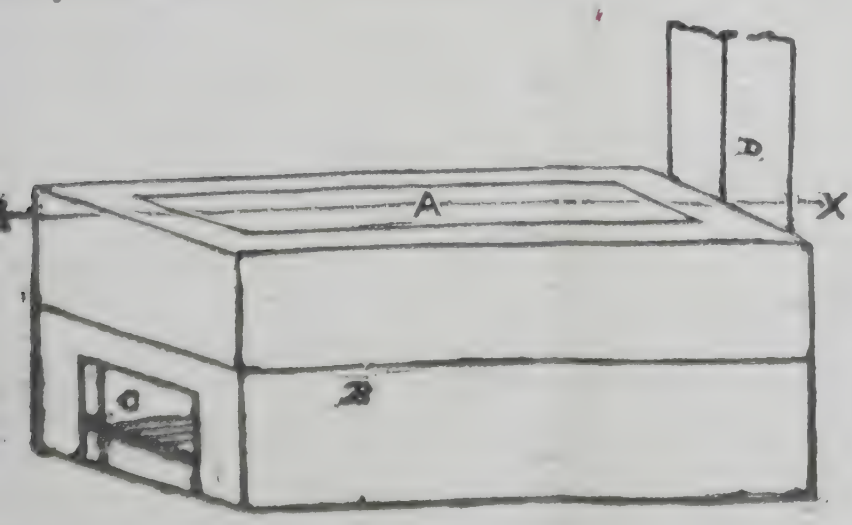


FIG. 1. ELEVATION.

some form of drying apparatus. Drying is well effected by spreading the coagulated milk on drying frames made by stretching brown linen on light wooden frames, somewhat like those used for framing school slates: these may be of any suitable size to suit the drying apparatus employed.

A small American fruit drier will answer very well, or a drying stove (Fig. 1) may be constructed by building, in brick, a chamber about 3 feet high, 3 feet wide, and 6 feet long (these dimensions can be changed in accordance with the amount of material to be dealt with). This is open at

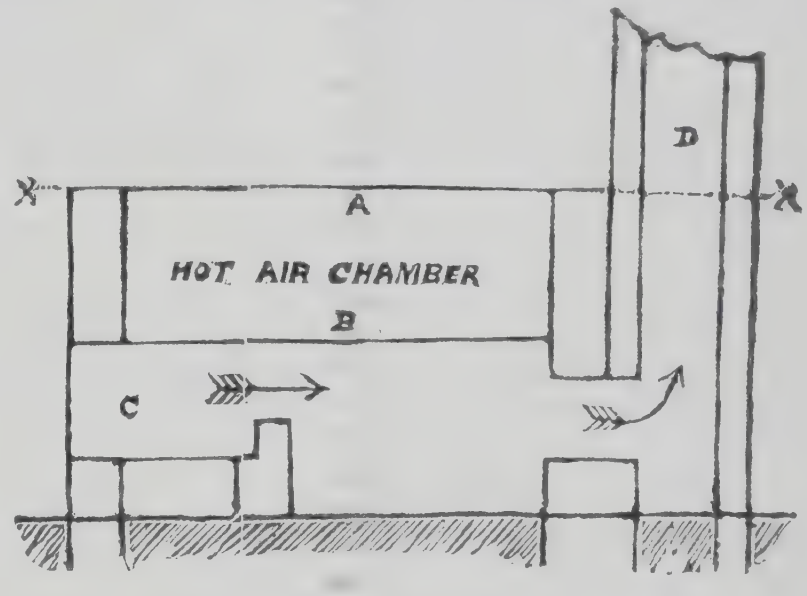


FIG. 2. SECTION ALONG THE LINE XX OF FIG. 1.

FIGS. 1 & 2. DRYING STOVE, FOR THE PREPARATION OF PAPAIN.

(A). Opening across which the drying trays are supported. (B). Iron plate. (C). Fire grate. (D). Chimney.

the top. About a foot from the top the chamber is divided horizontally into two compartments by a sheet of iron (B), and below this division a small fire grate (C) is constructed; at the opposite end from the grate a chimney (D) is placed to lead the smoke from the lower compartment (Fig. 2). In order to obtain an even heat in the upper compartment, it is well to spread a layer of sand, 1 or 2 inches thick, over the iron plates. The frames carrying the coagulated milk are placed on the top of the chamber, so as to form a lid or cover to the opening (A), when heat from the iron plate drives off the moisture at a low temperature.

It is important that the temperature at which drying is effected shall be as low as possible. Any overheating destroys the active principle, so that a carelessly prepared product may be useless. In practice the temperature is kept as low as is consistent with getting the substance dried before decomposition sets in; if this can be done without the temperature of the tray being raised above 100° F. so much the better.

As the substance becomes dry it shrinks considerably in bulk. The contents of several trays may now be emptied into one, and the drying continued. The trays emptied are ready to receive another day's supply of fresh material.

Drying must be continued until the substance is crisp and in such a condition that it can be reduced to a fine powder without any difficulty being experienced from stickiness. The dried material should be ground to a fine powder, when the resulting product should be a white or cream-coloured powder with a characteristic, but not putrid, smell. The powder should be packed in tins or bottles, and carefully preserved from contact with the air. Grinding is easily effected in a mill of the type commonly employed for grinding coffee: when grinding it is desirable to have the papain slightly warmed.

EDITORIAL NOTICES.

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Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number discusses the activities of Experiment Station workers in America, and the parallelism between the circumstances of their work in the States and these islands is brought out.

On page 355 will be found an instructive article on the recent Virgin Islands hurricane.

A valuable review of the work of the Antigua and St. Kitts Central Factories for the year 1916 appears on pages 356 and 357.

Insect Notes constitute a continuation of those in the last issue on a scale insect pest of citrus; Plant Diseases consist of an article on the dying of citrus trees.

Alleged Depreciation of Nyasaland Cotton.

In his Annual Report of the Department of Agriculture, Nyasaland Protectorate, for 1915-16, the Director discusses the question of the alleged depreciation of Nyasaland lint. The general opinion amongst the planters appears to be that there is need for a continuous supply of fresh seed each year from America. The Director is of opinion that the falling off in value of the crop during the last two years is due to poor cultivation and the need of manuring. It is maintained that the selected seed produced by the Department is satisfactory. In one quarter the view has been expressed that humidity is responsible for the depreciation of lint, but this is not borne out by what one observes in other places. For instance, in the West Indies, St. Vincent possesses the most humid climate of all the cotton-growing islands and yet produces the finest lint. It is probable that if there is any natural deterioration in Nyasaland cotton, it is due rather to the cultivation of mixed strains with consequent crossing and alteration of lint characters than to the effect of soil and climate. A suggestion has been made that the American cottons grown in Nyasaland having been used to periods of cold weather in the Southern States deteriorate under the humid uniform tropical conditions in Nyasaland. The whole question appears to require critical investigation on the spot, and we may expect to see in the next Annual Report of the Nyasaland Department of Agriculture that this has been done.

New Council of the Imperial Institute.

The formal transference of the Imperial Institute to the Colonial Office and the reconstitution of its management have already been noted in this Journal. In the *Bulletin of the Imperial Institute* (Vol. XIV, No. 2, April-June, 1916) it is stated that the Executive Council provided for by the Imperial Institute (Management) Act, 1916, has been appointed, and the constitution of the Council is given. There are twenty-five members appointed: by the Colonial Office (14), the Board of Trade (5), the Secretary of State for India (2), the Board of Agriculture and Fisheries (1), the Governments of India (1), Canada (1), Australia (1), South Africa (1), New Zealand (1), and Newfoundland (1).

The Council is autonomous save for the general control exercised by the Secretary of State for the Colonies, and it is believed that the activities of the Institute will be greatly increased in usefulness and importance. The Council is certainly a strong and representative one from the Imperial trade standpoint. Two members only are men of science: this might be considered inadequate representation for a scientific institution if it were not for the fact that the new position of the Institute has a very important political

significance, namely, to make the Empire as self-supporting as possible in regard to the development and utilization of raw materials. Science is needed in the internal work of the establishment, and it may be assumed that increased provision for this is included in the new scheme. There is no doubt that the Imperial Institute will find itself in closer contact with the Colonies and Dominions than was previously the case.

An Interesting Expedition.

An interesting announcement is made in the Inventory of Seeds and Plants imported by the United States Office of Foreign Seed and Plant Introduction during October to December 1913. An expedition left Washington to make a careful survey of the navel orange region around Bahia, and also study of orange growing around Rio de Janeiro. Its object was to find, if possible, the origin of the Bahia navel orange, and to discover strains of this remarkable orange which might prove more productive or better in other respects than varieties which have originated in California from the cuttings introduced into North America in 1870. In addition to securing budwood of promising strains of this orange which have originated in Bahia through bud variation, the expedition secured the stocks upon which the navel orange is grown in its own home. Strong evidence was also found that the Bahia navel originated, probably in Bahia itself, as a bud sport from the Selecta orange, which has been grown there since the earliest days of orange culture in Brazil.

Egyptian Sheep.

In the West Indies sheep-breeding has been and is carried on chiefly with a view to the production of mutton, the animal principally grown being the hairy or woolless breed, and the quality of the meat is recognized as excellent. In other warm countries sheep are not exclusively bred for mutton, as appears to be the case in Egypt, for instance.

The *Bulletin of the Imperial Institute* (Vol. XIV, No. 2. April-June 1916) contains an interesting note on Egyptian sheep, from which it appears that, although sheep-breeding cannot be said to be an important industry in Egypt, yet the animals occur in fair numbers in parts of the country. Three breeds of sheep are found in Upper Egypt, viz. Saidi, Ebeidi, and Sanabawi. In Lower Egypt also three breeds occur. These are the Ooseemi or Merais, Fellahi, and Rahmani. The advantageous conditions of feeding render it possible for the Fellahi ewes to be milked for the manufacture of cheese and butter. The wool is similar to that of the Saidi, being black, long, and silky, with a good deal of grease. A sample of skin wool of this breed was priced in Liverpool at $13\frac{1}{4}d.$-$14\frac{1}{4}d.$ per lb The Rahmani, originally imported from Syria, is found throughout the north of Beheira and Gharbia. The grazing ground here is good, and Rahmani mutton is consequently of excellent quality, being brighter in appearance than that of Ebeidi, but not so fat.

A breed of sheep found in the Barqa District of eastern Tripoli and known as the Darnawi, Gharbawi, or Barquei, occurs along the Mariut coast-line of north-west Egypt. These sheep are well fed and the ewes are milked, whilst the quality of the meat, especially that of the lambs, is excellent.

Sudanese sheep occasionally come into the Egyptian market. They can be recognized by their greater size and absence of true wool, their covering consisting merely of short hairs of no value. The skins, however, are of good quality, and are in demand for export.

An account of the method of preparing Egyptian hides and skins is given by Mohammed Askar Effendi in *Agric. Journ. Egypt* (1915, 5, 31). The principal tanning material used is sant pods (*Acacia arabica*), the best of which are stated to be brought from the Sudan.

Peasant Instruction in Grenada.

In the monthly reports of the Agricultural Instructors, Grenada, for September 1916, recently forwarded to this Office, it is stated that 133 peasants' holdings were visited in the parishes of St. David's (97), St. Andrew's (10), and St. Patrick's (26). All were competitors in the Prize Holdings Competition. The work down on the majority of these holdings is reported to be of a high standard and superior to the average work done on the best worked estates in the island. Pen manure has been applied this year on all but five of these holdings, and it is noteworthy that in the parish of St. David's, mulching with material from outside the holding was done on almost all the lots. The most satisfactory feature of the work done during the year on these holdings is the draining of the land. This line of work has shown very satisfactory progress, and it may now be said that the peasants are realizing the value of draining their cacao fields properly. Progress of work on the experiment plots at Morne Rouge, Westerhall, St. Cyr Mountain, and Mt. Pleasant, Carriacou, is also reported as satisfactory. In St. George's parish (39), St. Marks (17), and St John's (75), making a total of 131 peasants' holdings that were visited in addition to the above. By far the greater number of these visits consisted in the judging of gardens (provisions) entered for competition in the Prize Holdings Scheme. Some good work was presented for competition, but in some cases, the work was of rather an indifferent kind.

On the whole, it may be stated that the increased amount of instruction work in Grenada is producing very gratifying results.

INSECT NOTES.

A SCALE INSECT PEST OF CITRUS AND ITS CONTROL.

The following is a continuation of the article in the last issue of the *Agricultural News*, on *Chrysomphalus dictyospermi*, reproduced from the *Review of Applied Entomology*. The first part dealt principally with the characteristics and habits of the pest. This part concerns the important subject of control:—

The report of work done with insecticides occupies over three-fifths of the paper, and the experiments are described in detail. The study of the immunising power of insecticides was undertaken on a considerable scale in Sicily, with better success than previously obtained in Liguria by Del Guercio. This attempt to discover whether the plants could be rendered distasteful to the young larvae for a period sufficiently long to make it impossible for the individuals of one whole generation to attach themselves, showed that the addition of a colloidal adhesive so increased the insecticidal power of polysulphide of calcium as to make such an addition indispensable in the control of *C. dictyospermi* on citrus plants. The polysulphide of calcium was prepared as follows: 6 gallons of water were put in a boiler of 69 gallons capacity and heated to 113° F., 30 lb. of fresh quicklime (broken just before use into lumps as big as the fist) was then thrown in and allowed to disintegrate without being touched or stirred up in the liquid; 30lb. of sulphur was then added. The sulphur (which contained 2 per cent. of Cu SO_4 and was the same as that used against vine mildew) was added by degrees, being dropped through a sieve; the presence of copper does not however appear to be essential. The sieve had two long handles, and the workman wore protective goggles. As soon as the sulphur was added, the mixture was well stirred until a homogeneous paste was formed in about fifteen to twenty minutes, 30 gallons of water being then poured in and the whole boiled for about an hour and a half, when the mixture was ready. At first it contained impurities in suspension which gave it the colour of roasted coffee, but with a green tinge. After the sediment had formed, the clear liquid was red-brown in colour. At a temperature of 68° F. its density was about 1·21. The flour paste, adhesive was prepared as follows: in a boiler of the size given above 30 gallons of water were heated to 122-159° F., and 30lb. of wheat flour (free from bran) dropped in through a sieve by one workman, while another stirred without ceasing in order to prevent formation of lumps. Stirring was continued, and after a few minutes the fire was raked out to prevent an excess of froth; a few minutes later stirring was discontinued and the liquid allowed to cool. It contained about 10 per cent. of flour. The polysulphide of calcium may be prepared a long time before use, but the paste solution goes bad quickly, and should not be made and mixed with the polysulphide earlier than the day before that on which spraying is performed. As the spray solution must contain 2 per cent. of flour and the paste contains 10 per cent. of flour, it is only necessary to pour a convenient quantity of paste solution into a tub, then add the proper quantity of polysulphide, and finally dilute with water until the total bulk of liquid is five times that of the paste solution; the spray is then ready for use. The presence of 2 per cent. wheat flour changes somewhat the physical characteristics of the polysulphide solution and renders it turbid. The solution of calcium polysulphide was found to be very frothy if decanted with a certain violence, and this frothiness persists even when the strength of the solution is reduced to 5 per cent. by adding water. The solution is not hygroscopic until the paste is added, when the mixture becomes so to a slight degree.

The potassium polysulphide used in the experiments was in the form of tiles weighing about 2 lb. each. These are very hygroscopic, and if broken up small, they dissolved quickly even in cold water. In the experiments a 33⅓ per cent. solution was produced by dissolving 10 lb. of potassium polysulphide in 2 gallons of water and then diluting up to 3 gallons of liquid. This stock solution was kept in tightly closed glass bottles; at a temperature of 58° F. its density was 1·23. Both the 2 per cent. and 8 per cent. working strengths were less frothy than those of polysulphide of calcium, even with the addition of the boiled paste. Strong solutions, such as 5 per cent. and 7 per cent., were very viscid to the touch owing to their alkalinity, and they somewhat affected the skin. They never damaged the rubber hose, whether cold or hot. In cases where the calcium and potassium polysulphides were mixed, flocculent tufts were formed—even when the two solutions were clear before mixing. Though the mixture was somewhat viscid, it did not stick to the citrus leaves, and therefore required the addition of the paste. With such an addition, it yielded on drying a coating which was highly resistant to atmospheric agents, and this property is the more marked when the polysulphide of calcium is predominant. For instance, a spray containing 2 per cent. of polysulphide of potassium, 4 per cent. of the concentrated solution of polysulphide of calcium, and 2 per cent. of flour, was very adherent to the foliage and resisted well the action of rain. The leaves of citrus plants are able to resist chemical action to a considerable extent, and in December calcium polysulphide was safely applied at a strength of 14 per cent.; in summer 5 per cent. was found to scorch the young fruit if applied in the hot hours of the day, but not at other times. The potassium polysulphide was variable in action according to the dampness of the atmosphere, the temperature being a less important factor; in July a 7 per cent. solution destroyed the Coccids and did little damage to leaves or fruit. In autumn however, the same dose injured many leaves and fruit, and a dose of 2 per cent. of the solution containing both polysulphides also proved injurious. In no case should the polysulphides be applied when the citrus plants are in blossom. Even at doses of 3 or 4 per cent. polysulphide of potassium had a very powerful and comparatively prompt action on the Coccids. The males were even more sensitive to it than the females, and the nymphs succumbed very quickly; to mobile larvae a dose of 0·4 per cent. proved fatal. The immunising action of polysulphide of potassium was also very strong and lasting, unless there was rain. Polysulphide of calcium behaved in a very different manner. Its action on the Coccids, though efficient, was much slower. In the early nymphal forms the mortally was ascertainable after eight to ten days, but with the adults a 5 per cent. dose required a fortnight or more to reveal its efficiency. Spraying should be done from June to September and after harvesting the crop, up to early in March. In the experiments good results were obtained both in summer and winter, but in Sicily the summer is preferable as rains are then less frequent, while winter treatment may mean several applications and a waste of material. In summer, with maximum temperature of 104° F., two applications of 5 per cent. polysulphide of calcium removed all infestation. If the applications were put off until the crop had been gathered, a stronger dose of 7 or 8 per cent. was necessary. If the

weather was not rainy, an interval of seven or eight days, never more than ten was allowed between the applications. This comparatively short interval was made possible by the great immunising power of the covering film, especially that left by the second application, which prevented attacks by larvae from the few surviving adults. It is most important that the spray should not be stinted, as a uniform coating is the object aimed at. The spray-nozzle should be at an angle of 45° to the rod.

THE SILKWORMS OF AFRICA.

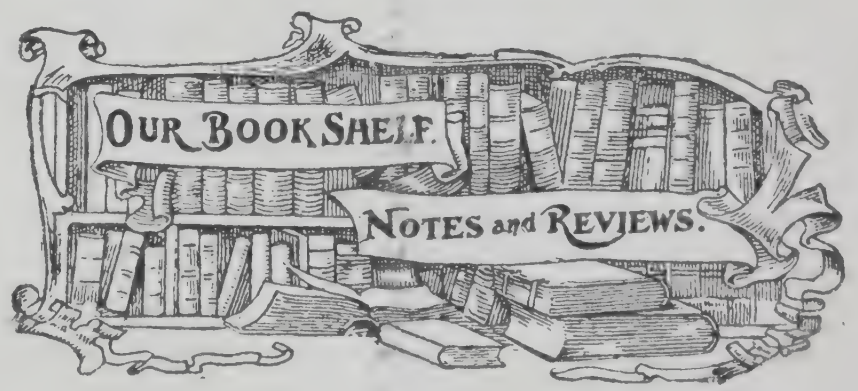
The only silkworms of commercial importance found in a wild state in Africa belong to the genus Anaphe (family Eupterotidae). The chief species occurring in British territory are *A. infracta*, Nigeria and Uganda; *A. venata*, Nigeria and Gold Coast; *A. Moloneyi*, Nigeria, *A. ambrizia*, Uganda; *A. panda* and *A. reticulata*, Natal. The cocoons of all these species are spun in masses, which are enclosed in a silken nest. The latter varies in size and shape according to the species; it may be hollow and more or less spherical, as in the case of *A. infracta* and *A. venata*, or flat, as in the case of *A. Moloneyi*. The envelope of the spherical nests usually consists of three layers: the outermost more or less papery in texture, the middle portion composed of loosely spun silk arranged as a number of super imposed sheets, and the inner layer hard and parchment-like; that of the flat nests consists of a single papery layer of closely interlaced silk. The silk of both nests and cocoons is naturally brown in colour, but in the absence of light the worms produce a white silk, and for this reason the natives in parts of Nigeria sometimes enclose them in calabashes.

Anaphe silk cannot be reeled, as is done in the case of mulberry silk, and it is therefore carded and spun as 'waste' silk; but apart from this, it more closely resembles mulberry silk than does any other kind. It takes dyes well and has been found suitable for the manufacture of velvet, plush, sewing silks and other materials. The degummed silk has been valued at about 1*s.* per lb., but owing to the large amount of labour required to free the silk from extraneous matter, and the low yield of degummed silk, the crude material, if shipped to the United Kingdom, would only realize about 1*d.* or 2*d.* per lb. If, however, the silk were cleaned locally by the natives, the clean product might be worth 6*d.* per lb. in this country.

The main difficulties in the way of establishing an Anaphe silk industry are (1) the fact that the nests have to be collected one by one over a large area, (2) the cost of cleaning the crude silk, and (3) the bulkiness of the material for export. These difficulties can be overcome to some extent as follows: (1) by domesticating the silkworm so that the cost of collection is reduced (and it has been shown experimentally in Uganda that the worms can be successfully domesticated); (2) by removing all chrysalides, twigs, etc., from the silk on the spot by native labour; and (3) by compressing the resulting clean product in bales for export. So long as the existing methods of collection prevail, it seems extremely doubtful whether the industry can be a success; but if the methods suggested above for reducing the cost of production were carried into effect upon a sufficiently large scale, and the clean product shipped to Europe, there seems to be no reason why a new industry, contributing to the welfare of several of our African possessions, should not be established. (*Bulletin of the Imperial Institute*, Vol. XIV, No. 2.)

A Pest of the Horse Bean.—During September a communication was received at this Office from the Agricultural Department, Grenada, referring to a pest that had been discovered attacking the foliage of horse beans. The caterpillars which were causing the damage were observed to resemble very closely in colour that of the particular foliage they were feeding upon. They were observed to cling to the undersides of the leaves and, when disturbed, they dropped to the ground with what appeared to be a springy motion that often caused them to reach the ground some little distance from the spot vertically beneath the part of the plant on which they were feeding when disturbed. The letter points out that these peculiarities of the insect may account for their not having been discovered before.

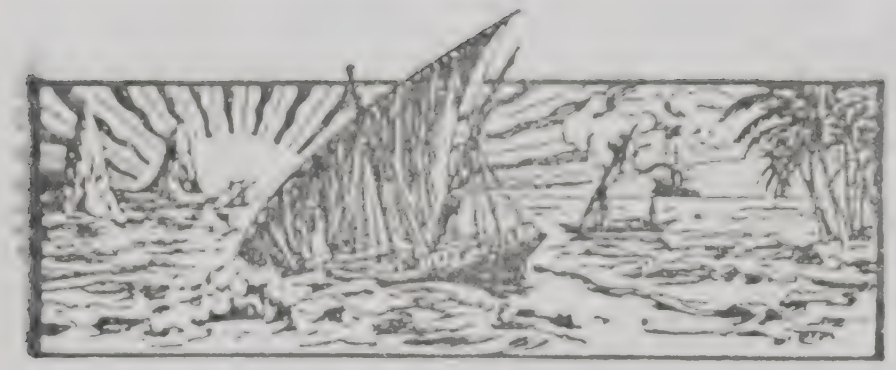
Accompanying the letter were several moths bred out in Grenada from the caterpillars. These moths were identified at this Office as examples of *Thermesia digitalis*, the well-known woolly pyrol moth, the larvae of which are very destructive of the foliage of many leguminous herbs (woolly pyrol, various beans, and ground nuts). The later generation (after they have become abundant) are usually heavily parasitized; lead arsenate might be used if it were worth while, but a preliminary experiment would be needed to find what strength was non-injurious to the plants.



GREEN MANURES AND MANURING IN THE TROPICS, by P. de Sornay, Translated by F. W. Flatteley, London: *John Bale, Sons & Danielsson, Ltd.*, 1916. Pp. 466, Figs. 74. Price 16*s.* net.

The title of the original French edition of this work is Les Plantes Tropicales Alimentaries et Industrielles de la Famille des Legumineuses, which was reviewed in the *Agricultural News* last year in Vol. XIV, No. 341, on page 165. The English title is less significant than the French, in view of the fact that it refers merely to a portion of the range of subjects dealt with. Reference to the previous review will furnish the reader with an idea of the contents, which include, besides an account of the tropical leguminosae in relation to manuring, lengthy accounts of the species useful as human food, discussions on prussic acid in the leguminosae, also starch, gums and resins, tannins, dyes, medicines and fibres, etc.

The work consists essentially of a compilation of facts carefully collected and arranged in a manner that facilitates reference. Special attention may be called to the excellent illustrations. An interesting feature of the book is the favourable opinion expressed of the Canavalias as bean crops. In the West Indies, the Canavalias for food purposes are regarded with a considerable amount of suspicion. Altogether the number of species of leguminous plants referred to in the book is 366 out of the 7,000 known to science as belonging to the order.



GLEANINGS.

Observations relating to the condition of staple crops in Grenada during September indicate that cacao is very promising, while limes may be considered, on the whole, satisfactory. It is stated that the peasant cultivations under cacao showed a marked improvement.

A statement is made in the *Journal of Agricultural Research* (Vol. VI, No. 2) as to the effect of sodium salts on plant growth. It is stated that the limit of tolerance of crop plants to the salt in the soil is determined by the quantity of the salt that can be recovered from the soil (i.e. non-adsorbed) rather than by the quantity added to the soil.

In the *Hawaiian Forester and Agriculturist* for July 1916 reference is made to the development of the hog industry in Hawaii. It is stated that the time is undoubtedly near when pork packing will be established in that territory, and the importation of hams and bacon will be discontinued. It is believed that the prices the cured product would bring should prove highly remunerative.

It is stated in the Annual Report on the Education Department of St. Lucia for 1915 that during the year agriculture was taught in seventeen elementary schools, and the eight schools examined presented scholars showing an increase of 5 per cent. on last year's number. Special attention has been paid to grafting and budding, and experimental work figured largely in the practical demonstrations.

In connexion with the notice in this issue of the work on Tropical Leguminosae, it may be mentioned that a personal article on the author appears in *Tropical Life* for September 1916. The author, Mr. De Sornay, was formerly Assistant Director of the Station Agronomique, Mauritius, and is now Laboratory Director of the Cie Coloniale Engrais Chimique (Colonial Chemical Manures Co.).

According to a report in the *Port-of-Spain Gazette* for October 14, the Trinidad Board of Agriculture and Department of Agriculture and Agricultural Society have been exchanging compliments in regard to the satisfactory results obtained from the manurial and other experiments on cacao at River estate. It appears that in Trinidad general satisfaction is felt that at last manurial experiments with cacao have been put on a sound and satisfactory basis.

West Indian readers interested in the production of bay oil will note with interest the article on bay oil constants in the *Perfumery and Essential Oil Record* for September 1916. The request is put forward that the above-mentioned Journal may be supplied with samples of bay oil of specific gravity between ·936 and ·938. Reference to the figures recorded shows that the percentage of phenol in oils within this range of specific gravity may vary as much as from 32 to 48 per cent.

The trade of St. John, New Brunswick, receives attention in *The Board of Trade Journal* for August 10, 1916. As regards agricultural conditions in New Brunswick, there appears to be very little difference in the acreage sown this year. It is stated that in some localities there is a slightly smaller acreage under potatoes, owing to the high cost of commercial fertilizers. The English potato benefits by the application of artificial manures, particularly potash, more than perhaps any other crop.

One of the rainiest months of August, says the Demerara *Daily Chronicle*, had for its successor, September, an exceedingly dry and hot month, the average fall of rain during that period working out at 1·95 inches and on a basis of forty-five returns from the various stations, as against 9·13 inches for August. The highest fall registered in Georgetown was 1 inch on the 8th, and the lowest on the 22nd, namely 19 parts. The average for the counties worked out at 1·93 inches for Demerara, 2·29 for Essequibo, and 1·21 inches for Berbice.

Turmeric in Porto Rico is the subject of a note in the *Chamber of Commerce Journal* for July 1916, in which it is stated that this plant grows wild over a considerable portion of Porto Rico, and is fairly abundant. It is used by the natives as a dye for the fibres from which hammocks are woven, also for ribbons, cloths and the like. It is added that text-books say that the yellow dye obtained from the root is not fast, but the natives nevertheless appear to have rendered it quite permanent.

Reference is made in the *Gardener's Chronicle* for September 16, to the possibility that there may be in existence microscopic parasites of plants, so small that they cannot be viewed under the microscope in its present stage of development. It is believed that these invisible organisms may possibly be the cause of the strange mosaic disease of tobacco and of tomatoes, and of the leaf curl of potatoes. It is pointed out that ultra-microscopic organisms if they do affect cultivated plants open up new and difficult problems to the plant pathologist

Information has been received from the Antigua Agricultural Department to the effect that the Antigua Lime Growers' Association has now been definitely inaugurated, and is affiliated to the Antigua Onion Growers' Association and the Antigua Cotton Growers' Association. The Lime Growers' Association intends to start business in a very small way in the first instance, and to confine its attention to commercial experiments in the packing, handling and shipment of green limes. It is hoped eventually to work up an export trade in fruit and vegetable produce. With the object of facilitating such developments, a central board for co-operative organization has been formed, comprising one representative each from the onion, cotton and lime growers' associations, and two from the Agricultural and Commercial Society.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

MONTSERRAT. According to the report of the Curator (Mr. W. Robson) for September, work in the experiment stations consisted of reaping operations. Plants distributed comprised 3,050 lime plants, 4,650 Bay plants, 10 tangerines, and 15 lb. fleshy pod beans. Three distillations of Bay leaves were made in the Botanic Gardens. Regarding staple crops, Mr. Robson considers that the return of cotton per acre will be above the average: the weather since the middle of September has been ideal for reaping. The price paid at present for peasants' seed-cotton is 4*d*. per lb., not more than 3*d*. having been paid in any previous year. There does not seem to have been much loss of cotton through pests or diseases, and cotton stainers are not reported anywhere to be very numerous. Results from ground nut trials on estates are considered fair. There were considerable complaints from onion growers about the damping off of seedlings, and in many cases a partial failure to get the plants past the seedling stage. Experiments carried out in the Station in connexion with damping off do not promise to be very conclusive. The examination of the progeny of the selected cotton was commenced, about 200 plants being examined for lint length. Dr. Watts the Imperial Commissioner visited the island from September 3 to 8, and addressed a representative meeting of planters at the Court House on the 6th. The rainfall at Grove Station was 5·54 inches Most of the rain fell during the first nine days of the month, with only one good shower of 84 parts on the 26th.

ANTIGUA. Mr. T. Jackson reports plant distribution for the month of September to have been as follows: coco-nuts 27, coffee 24, cacao 19, mahogany 12, decorative 46. A considerable amount of routine work in the nursery has been performed and large numbers of Prosopis, Eucalyptus, Bay seedlings, etc., have been raised; onion seeds planted have germinated well; beds, borders, lawns, etc., have received necessary attention. The young cane crop continues to improve, although at the present time rain is required. Orders for 1,000 coco-nuts have been received. Fairly large order for vegetable seeds has also been received and forwarded to the United States of America. In regard to pests, grubs of hard back beetles have been attacking onions in nursery beds; attempts have been made to control the pests with carbon bisulphide emulsion. Leaf-blister mite has been attacking cotton, while attacks of caterpillars have been experienced in some localities. The rainfall for the month was 2·90 inches; for the year 37·87 inches. Rain is required throughout the island at the present moment. Appended to this is a short report on agricultural instruction work for the month of September.

NEVIS. Mr. W. I. Howell writes to say that during September the plots in the Experiment Stations have been kept weeded, and are in good order. The following plants, seeds, etc., were distributed from the Station: 19,850 sweet potato cuttings, 11,450 cassava cuttings, 11lb. black-eye peas, 6 lb. eddoes, 150 onion slips. The cane crop, on the whole, is looking very promising, and a good return is expected throughout the island. The cotton crop throughout the island has improved and picking has begun in some places, but the returns will be poor. Cotton worms attacked many fields but they were kept in check by poison. Eighty-three pounds of onion seeds were imported and supplied to growers. The germination, on the whole, was very good, and about 10 acres will be planted in onions this season. Cotton stainers made their appearance in a few fields, and the growers were advised to destroy the stainers at once. A meeting of planters was held on September 14, at which an address was delivered by Dr. Watts the Imperial Commissioner. The first meeting of the Nevis Onion Growers' Association was held on September 20. Several meetings *re* a Central Factory for Nevis were also held during the month. The rainfall for the month was 2·00 inches; for the year to date 41·70 inches.

TORTOLA. Mr. W. C. Fishlock's report for the month of September mentions a continuation of work commenced in the Experiment Stations previously, coupled with manurial, cultural, and planting operations. Touching staple crops, all the cotton he has seen appears to be in good condition : no serious damage appears to have been done by wind. Canes also promise well. Regarding pests, he says, Batocera, in considerable numbers has been reported from Cappoons Bay: it is now reported as attacking avocado pears and mangoes. Weather is reported as good. Rain fell in measurable quantity on twenty-four days of the month, the total record fall being 5·48 inches; average for the month for previous fifteen years is 4·80 inches. A cyclonic disturbance passed to north-east on the 20th inst., while an account of the destructive hurricane of October 9, is given on page 355 of this issue.

Agricultural Conditions in Barbados.—A statement as to the progress of sugar-cane cultivation in Barbados is contained in the *Agricultural Reporter* of that island for October 21. The cane crop is described as being well advanced and in excellent condition, with the exception perhaps that fields of B.376 show a tendency to trail, under the influence of heavy rains and wind. In at least half a dozen parishes arrows are now to be seen which is not to the liking of the planters, more especially in the case of B.376. The variety Ba 6032 is sending up spikey blades as though it meant to flower, but actual flowering very seldom occurs. The greater part of the black soil area is under B.6450 and Ba 6032.

For some weeks past the principal work on the estates has been the application of manures, and weeding. This latter operation has been troublesome this year owing to the heavy and persistent rains, which have stimulated to an unusual degree the rapid spread of devil's grass and other weeds in newly planted fields.

The corn crop has been a large and plentiful one this season, and at the time of writing several fields of this cereal are still outstanding to be broken in. Early yams are gradually being placed on the market, though nowhere in the island are as many vegetables planted as in past years, the result, it is supposed, of the present high price of sugar.

A paper appears in the *Journal of Agricultural Research*, Vol. VI, No. 24) on bacteriological studies of the soil subjected to different systems of cropping for twenty-five years. Continuous corn and wheat with no additions of manures or chemicals have brought about a relative low oxidizing power in the soil complex. The addition of manure materially raises the oxidizing power, especially under continuous corn and wheat. The addition of commercial fertilizer brings about a condition similar to that of manure, though perhaps less marked.

PLANT DISEASES.

THE DYING OF CITRUS TREES: A COMPARISON.

An old and difficult question, which has arisen in many countries, is raised in relation to Queensland conditions in an article by Mr. A. H. Benson, Director of Fruit Culture in that State. (*Queensland Agricultural Journal*, May 1916.) It concerns the dying out of citrus trees under circumstances which do not afford any but obscure indications of the reason for the failure. That there is a broad similarity in the underlying causes of these losses in different places is beginning to appear. In Queensland as in other countries similarly affected, attention has first been given to the soil conditions. A careful chemical and biochemical survey has been conducted by Mr. F. Smith, of the Chemical Branch of the Department of Agriculture. The conclusions reached are, briefly, (1) that it is not possible to assign unfavourable soil or environmental conditions as primary causes; (2) that it is possible to recognize, in conditions unfavourable to normal vigorous or healthy growth, causes contributing to susceptibility to disease; these may be physical, viz. deficient drainage, water-supply, or aeration; chemical, viz. deficiency of the elements of plant food; and biochemical, viz. disturbances of the normal activities of bacteria in the soil, upon which the presentment of adequate and acceptable forms of food supply to the plant depends; (3) an important contributory factor is considered to be heavy bearing with consequent constitutional predisposition to disease.

Commenting on this report, Benson concludes that the dying of citrus trees in certain districts cannot be due to unfavourable soil conditions, since no marked difference is revealed between the soils on which trees have died and those of virgin lands or unaffected orchards.

Resuming consideration of the general question, the author admits that he is unable to show what is the cause or what are the causes of the trees dying; but he is of opinion that it is a very complex matter indeed, and is probably due to various agencies acting more or less collectively and bringing about the results that have been experienced. The discussion of these causes which follows is of sufficient interest, in the parallels it affords with certain experiences of lime growers in the West Indies, to be quoted verbatim:—

> Although the majority of the trees that died were in full bearing, and possibly some of them may have reached their natural end—in other words, died of old age, this does not apply in all cases, as older trees are still living where much younger ones have died out. At the same time, the question of old age must be considered, as we have no definite information respecting the longevity of citrus trees in this State to enable us to say exactly how long they are likely to live; and, further than that, there is the probability that the age to which the trees will live depends largely on the soil in which they are planted and the climatic conditions under which they are grown. The more even and regular the conditions of growth the longer the tree is likely to live, and the more it is subjected to sudden and extreme changes the sooner, in all probability, it will begin to fail. The climate of many parts of this State is undoubtedly trying to citrus trees, though they certainly stand very rough treatment and recover when conditions become more favourable. Long dry spells frequently produce a stagnation of growth which is succeeded by an excess of growth when the ground has received a good soaking, and these rapid changes tend to weaken the constitution of the tree and impair its longevity. These remarks are borne out by actual experience, as the districts in which the greatest losses have taken place have irregular raintalls, whereas in those districts where the rainfall is fairly regular there have been practically no losses, even of trees that are much older than the majority of those that have died out where the rainfall is not so evenly distributed throughout the year.
>
> I am therefore of opinion that one of the most important steps towards increasing the longevity of citrus trees is the maintenance of a sufficient supply of moisture in the soil at all times to permit of the proper and regular development of the tree. This in districts where the rainfall is uncertain and irregular, can only be brought about by judicious irrigation, which must be given as soon as the trees show signs of the want of moisture, instead of putting it off, in the hope of rain coming, till they have become seriously injured. The main object is to obtain an even growth and to keep the trees in a healthy condition the whole time. I have, therefore, to advise that, where trees show signs of dying out, systematic irrigation, to provide a regular supply of moisture to the soil at all times when needed, be carried out wherever practicable. Where water is not available, these growers will have to depend on thorough cultivation, which will enable the trees to stand moderately dry spells without serious injury, but which will not stand the strain of a drought.
>
> This irregularity in the growth of citrus trees is undoubtedly one of the causes of the trees dying, but it is not the only one, although its effect on the vitality of the tree may be such that it renders it unable to throw off or resist fungus diseases which always accompany the dying out of citrus trees. In other words, the irregularity of growth may be the prime factor that leads eventually to the death of the tree. If this is so, then the importance of maintaining even conditions of growth cannot be overestimated. The overmanuring of the trees with highly stimulating fertilizers, which has taken place in some orchards where there has been serious loss,—may also possibly account for such loss, as heavy manuring is apt to produce abnormal growth, and unless the manure has been applied at frequent intervals, the growth is irregular; and, as I have previously pointed out, irregularity in growth is conducive to the maturing of the constitution of the tree. Great care should therefore be taken in the use of such manures to see that the trees do not receive an overdose at one time and lack food at another; small and frequent applications are therefore preferable to heavy dressings at longer intervals.
>
> Insufficient drainage, which frequently accounts for the dying of the roots of citrus trees, cannot be held responsible for the death of many of the trees, as they were growing in soil possessing perfect natural drainage, in which there would be no possibility of stagnant water accumulating round the roots, though it is probable that, in some instances, it has been a contributing factor, and where such is the case drainage would certainly prove beneficial.
>
> In nearly every instance in which the trees have died there has been more or less gumming—sometimes of the branches and sometimes of the main trunk at its junction with or near the soil, and very frequently both forms of gumming are met with. Usually the roots are badly affected and are killed outright, but in other cases the roots, or at any rate a part of them, are perfectly healthy, and all of the tree above the ground is dead.

The main idea set out in this extract may be compared with an opinion expressed by R. E. Smith concerning citrus die-back on a certain type of soil in California: 'The disease appears to be brought about in some manner through an irregular food supply, resulting form irregular water-supply which trees get in this soil unless irrigation is particularly well carried out.'

Coming now to a comparison with experience in the Lesser Antilles, it should be stated first of all that the type of failure met with here is almost invariably die-back, of branches or roots or both. Gummosis is comparatively rare. If the failure is to be regarded as the end result of adverse conditions and not of the action of any specific parasite, the manner of it is not of first importance. Moreover, die-back is described as causing considerable and extending loss in Queensland, taking many forms and attacking every part of the tree both above and below ground.

There are two broad classes of trouble with lime trees in these islands, for both of which, as regards the causes believed to be responsible, close comparisons may be found in the account of the Queensland experience above.

In the drier islands, of which Montserrat is most conspicuous in view of its definite lime industry, it has been so common as almost to amount to a rule, for lime trees once they have been sucessfully established, to grow and bear well for a few years, and then to begin to die back. On outstanding twigs and branches the leaves curl up and drop, the fruit yellows prematurely and shrivels and the branch dies, usually without any attempt to develop new foliage.

A *Colletotrichum* on the twigs, and a *Diplodia* on the branches may extend the injury beyond the point it would otherwise reach, the latter especially being able to get into a main branch from a side shoot and cut off supplies to the branch system above the junction, but these fungi cannot be regarded as the primary cause of the die-back. During a wet season recovery takes place to some extent by the development of branches from below the injury, but in many cases the loss is not balanced by this process, and progresses year by year until the tree is killed. In Montserrat a similar sequence of events has been traced upon the roots, due to the infestation by weakly parasitic fungi of the wood of roots which lack sufficient vigour to cover up the wounds make by soil grubs of the *Exophthalmus* and *Diaprepes* type. The seasonal nature of the affection, and the fact that it does not occur in the same form in the islands with no pronounced dry season, show its relation to water-supply, but it cannot be regarded as a simple drought effect, since the trees will grow well for a period of years, and then fail, under conditions not more severe, and at a time when younger trees are flourishing. It may in fact be regarded in the manner suggested by Benson, as a question of the reduction of longevity under conditions of irregular growth. Putting the period of life under these circumstances at roughly ten years, we find from examples afforded by old plantations that in Dominica it may be multiplied in fertile soils at least by three or four.

The second class of trouble is one which can be seen most clearly in Dominica, where it is free from complications as to water-supply, but, examples of which have emerged from other factors in Montserrat and elsewhere. It has to do with another type of irregularity, that of food supply. The clearest cases are exhibited where chemical manures have been used and have stimulated rapid growth which owing to their lack of residual effect has been left for a period unsupported. This has resulted in a die-back very similar in its effects to that already described, and when the two are combined the results are particularly fatal. Experience points to the danger, in situations liable to long spells of dry weather, of adopting any measures which lead to sudden accessions of growth.

As regards the effect of heavy bearing, referred to in F. Smith's report above, parallels are also to hand. In August of this year Mr. W. Robson, Curator of the Botanic Station, Montserrat reported that following a dry June lime trees had received a marked set-back, and suggested a connexion between this and the attempt to develop a large crop on an insufficient rainfall. The writer had independently reached a similar conclusion with regard to a group of lime trees under observation in Barbados. In the early months of this year these trees were very healthy and vigorous, and began to develop a very heavy crop. About June, the weather being dry for a period, very many branches with half-grown fruit shed their leaves and died. The branches which were bare but not yet dead when rains ensued, revived and put out new foliage. This is of course only a special case of the die-back already described, but the point of interest is that the trees would probably not have suffered at this time had they had not been bearing heavily

In view of the considerations set out above, the striking results obtained some years ago in experiments conducted by this Department in Montserrat are significant. Vigorous cultivation of selected plots led to very active growth and the production of large crops for a season or two, but these results were followed by an equally striking decline, which was rather accelerated than checked by the application of manure, and ended in the ruin of the trees.

The statement of the trouble as arising from the intolerance of citrus trees for irregular conditions does not solve the question as to its cause, and by tending to refer it to the inherent constitution of the plant, seems to place it in a large class of problems at present insoluble It is important, however, as permitting a varied set of experiences, common, as has been shown to such widely distant countries as Queensland and the West Indies, to be brought into relation with each other and expressed in a general formula.

The measures which have been recommended by this Department may all be regarded as tending to smooth out as far as possible the irregularity of the conditions in the drier islands. They comprise the conservation of soil moisture by heavy coverings of vegetable mulch, the conservation of atmospheric humidity by close shelter, and the use of pen manure as the fertilizer with the slowest and most regular action.

W.N.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 2, 1916, with reference to the sales of West Indian Sea Island cotton:—

The only business done in West Indian Sea Island cotton since our last report is a sale of 25 bales Stains at $12\frac{1}{4}d.$

Owing to the high prices at which Sakalarides Egyptian is ruling, good West Indian should be worth $20d.$ to $21d.$

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 30, 1916, is as follows:—

ISLANDS. The receipts to date being only 64 bales, the Factors have not sampled any of it, and will not offer any cotton for sale until the stock is larger, therefore the market has not opened.

FLORIDAS AND GEORGIAS. The demand continued very active throughout the week, both in Savannah and in all the interior markets, taking all offerings at very full prices, and at the close of the week the Factors in Savannah refused to sell under $\frac{1}{2}$-cent to 1 cent advance. The interior was also dearer, and $\frac{1}{2}$-cent advance was freely paid, the buying being on account of the Northern and Southern Mills.

The general feeling is bullish, there being some speculative demand in expectation of higher prices ruling.

The future of prices depends upon the mills being able to sell their production on a basis of current or even higher prices.

MARKET REPORTS.

London.—The West India Committee Circular, October 5, 1916.

Arrowroot—2½*d.* to 4¾*d.*
Balata—Sheet, 3/3 to 3/6; block, 2/3½.
Beeswax—No quotations.
Cacao—Trinidad, 84/- to 85/-; Grenada, 72/6 to 73/-; Jamaica, no quotations.
Coffee—Jamaica, 65/-.
Copra—£32.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—Bananas, £17 per ton; Oranges, Jamaica, 16/- to 18/- per case.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—Jamaica, 35/- to 45/-.
Lime Juice—Raw, no quotations; concentrated, £22; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6*d.* to 2*s.* 2*d.*
Nutmegs—5¾*d.* to 1*s.* 2*d.*
Pimento—3⅛*d.* to 3½*d.*
Rubber—Para, fine hard, 3*s.* 2½*d.*; fine soft, 2/11; Castilloa, no quotations.
Rum—Jamaica, 3/11 to 5/7.

New York.—Messrs. Gillespie Bros. & Co., October 10, 1916.

Cacao—Caracas, 14¼c. to 14¾c.; Grenada, 15c. to 15¼c.; Trinidad, 14¾c. to 15c.; Jamaica, 11¾c. to 13c.
Coco-nuts—Jamaica and Trinidad selects, $42·00 to $43·00; culls, $20·00 to $21·00.
Coffee—Jamaica, 9¾c. to 12c. per lb.
Ginger—14½c. to 17½c. per lb.
Goat Skins—Jamaica, 63½c.; Antigua and Barbados, 60c. to 63½c.; St. Thomas and St. Kitts, 60c. to 62c. per lb.
Grape Fruit—Jamaica, $2·75 to $3·50.
Limes—$4·50 to $5·00.
Mace—45c. to 51c. per lb.
Nutmegs—16c. to 17c.
Oranges—Jamaica, $1·50 to $3·25.
Pimento—5c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·02c; Muscovados, 89°, 5·27c.; Molasses, 89°, 5·145c. all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 5, 1916.

Cacao—Venezuelan, $15·50 to $15·65; Trinidad, $15·25 to $15·75.
Coco-nut Oil—$1·15 per Imperial gallon.
Coffee—Venezuelan, 15c. to 16c.
Copra—$5·50 per 100 lb.
Dhal—$7·00 to $7·10.
Onions—$4·50 to $5·00 per 100 lb.
Peas, Split—$11·50 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $7·50 to $8·00; White, $7·50 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 18, 1916; T. S. Garraway & Co., October 16, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·00 to $15·50 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda no quotations; Cacao manur quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$3·25 to $4·50.
Peas, Split—$9·65 per 210 lb.; Canada, $6·00 per 120
Potatoes—Nova Scotia, $4·25 to $6·50.
Rice—Ballam, $7·35 to $7·45; Patna, no quotation Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·25.

British Guiana.—Messrs. Wieting & Richter, Septe ber 30, 1916; Messrs. Sandbach, Parker & C October 20, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	$12·00
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	14c. per lb.
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	17c. to 18c.
Liberian	11c.	13c.
Dhal—	$7·00	$6·50 to $7·2
Green Dhal	——	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	2½c.	——
Madeira	4c.	4c. to 4½c.
Peas—Split	$12·00 to $12·50	$12·00
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·75 to $6·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·40	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50 to $6·00
Tannias—	$1·44	——
Yams—White	$2·64	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $4·75	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	——	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Stimulation of Motor Cultivation by the War.

WITH the growing scarcity of labour in European countries, there has arisen the necessity to make the most effective use of all available labour-saving implements and machines in agricultural operations. One result has been the giving of greater attention to motor ploughing,—on one side by the farmers, on the other by the manufacturers, both sides being anxious for national as well as for commercial reasons, that mechanical power be utilized on the land to the greatest possible extent.

A movement, stimulated by such urgent circumstances, is not likely to be barren in its results. The war has demonstrated in numberless ways the truth of the statement that necessity leads to invention; and it would seem well worth while for West Indian planters to take cognizance of what is being effected, and what will be effected in regard to the substitution of mechanically produced power for human and animal power on the land, in Great Britain and other European countries.

From information published by the English Board of Agriculture* it is evident that agricultural societies and institutions are closely investigating the subject in different parts of the country. The Royal Agricultural Society has issued estimates of the cost of motor ploughing based upon figures supplied by farmers who are actually using the machines and have had satisfactory results. There are two principal types of machine in use: the motor tractor, and the motor plough. In the motor tractor, as the name implies, the engine is separate from the plough it draws; in the motor plough the two are united to form one machine. The advantage of the tractor is that it can be used for work other than ploughing, for instance, haulage on roads and for driving threshing machines. It has a disadvantage not possessed by the motor plough, in that it requires more than one man to operate it. The motor tractor appears also to be more expensive to run, the total cost per acre for the tractor on light land being about 6*s.* compared with approximately 5*s.* in the case of the motor plough. In considering these figures it must be

**Journal of the Board of Agriculture* (England and Wales), Vol. XXXIII, Nos. 3 and 6.

borne in mind that the price of petrol in England is very much above the normal under present war conditions.

Tractor and motor trials at Stirling, in Scotland, have given very satisfactory results, particularly in respect of the latter. The Highland and Agricultural Society reports on the Wyles motor plough as follows: 'The 11-b.h.p. Wyles motor plough did excellent work on both types of land [heavy and light]. It required only one attendant, took two furrows, and was adjustable to various widths and depths. It was the only implement that succeeded with a two-furrow plough on the hill (gradient from 1 in 10 to 1 in 21) on the light land.' This ability to work on inclines is important as regards the West Indies.

As pointed out in a recent publication* which draws attention to results obtained by farmers in Illinois, U. S. A., one of the most important points in connexion with the purchase of a tractor or motor plough is to obtain one of suitable size for the farm on which it is to be used. A farm of 140 acres is the smallest upon which the smallest tractor in common use, the two-plough outfit, may be expected to prove profitable. In this connexion we may refer the reader to a note that appeared in this Journal† describing a recently invented motor plough for light work, suitable for small or medium holdings. It costs £120, and weighs with ploughs included only 840 lb., develops 3 to 4 h.p. and does 3½ acres in ten hours. But it will not do deep ploughing, nor is it suitable for heavy land.

The Wyles motor plough referred to above costs about £175, and from all available sources of information would appear to be the most satisfactory machine on the market at the present time.

Associated with this plough is an interesting and instructive instance of agricultural co-operation. Last year, owing to the scarcity of labour and horses and the increase in the number of small holdings at Pinvin, in Worcestershire, the members of the local agricultural co-operative society found it almost impossible to get their ploughing done by neighbouring farmers as in the past. The society decided, therefore, to take steps to purchase a Wyles motor plough to be used co-operatively by the members, and approached the Worcestershire County Council with a view to obtaining a loan of £175 for the purchase of the plough. Although they fully sympathised with the proposal, the County Council decided that in present circumstances they could not see their way to make the necessary loan, and the Society, therefore, had to obtain the money from other source £92 10*s.* was raised by subscription and £96 fro friends of the movement, the latter sum being treate as loan share capital. After paying for the plough a stock of petrol, and for certain labour in preliminar trials, there was an adverse balance of £2 11*s.* 9*d.* Th plough was not obtained in time for the autum ploughing in 1915, and in the early part of 1916 th weather was too bad to allow of its being used very muc From the work carried out, however, the Society a satisfied that the enterprise will be successful an profitable to the members.

Whether similar arrangements could be effecte in the West Indies is a point for consideratio Co-operative ploughing in St. Croix was tried, and, is believed, with some success. Being less depende upon weather conditions, co-operative ploughing fro a practical point of view ought to be more easi arranged in the tropics than in a northern country, an two or more planters whose properties adjoin might fin investment in a machine profitable and convenient.

One objection to a universal employment of th motor plough would be the reduction of stock and, conse quently, the amount of pen manure available for the field Many planters, however, who use mules would, in vie of the present high price of these animals, find tractor that could be used for ploughing and haulage useful substitute. As to the cost of motor cultivatio in the West Indies, there is one aspect of fue supply that should not be overlooked. It was pointe out in this Journal* that alcohol can be easily prepare from molasses, and that with certain treatmen the alcohol can be used instead of petrol as fuel in the ordinary oil engine. On large group of estates associated with a central factory it shoul be possible to obtain this fuel at a price muc below that of petrol and so make motor ploughing a once a paying operation. The production of Natalite a motor spirit obtained from molasses, was described i this Journal a short time ago, and it was stated tha the addition of ether to the alcohol, together with a small quantity of alkali, the former increasing the volatility of the mixture and the latter neutralizing acids produced on combustion, produces a fuel which is equal in value if not superior to petrol.

The whole question, therefore, of employing motor cultivation in tropical countries, particularly sugar-cane countries, is worthy of definite attention. In the first place it has been shown that progress in the matter of

Experiment Station Record, Vol. 35, No. 3, p. 292.
†Vol. XV, No. 365, p. 142.

* Vol. XIII, No. 330, p. 81.

onstructing suitable machines is being made under the timulus of war; in the second place their employment s becoming more extensive from the same cause, and n one instance at least, this has led to a successful demonstration of co-operative ownership. The last fact o be noted is that alcohol from molasses might be used or fuel instead of petrol, thereby securing a cheap and ocally-produced article.

CROP CONDITIONS IN BARBADOS.

In the *Agricultural Reporter* of Barbados for November , a statement is given as to weather conditions, and the progress of sugar-cane cultivation in that island during the month of October and up to the above-mentioned date. It s shown that the total rainfall for the year to date exceeds hat of 1915, between 70 and 75 inches having been recorded n the Scotland district. In spite, however, of the very eavy and continuous rains, there has not been any serious looding or damage to crops, and a remarkable feature noted, as been a continued absence of thunder and lightning, and, ince October 10, of high winds.

The cane crop has made excellent progress, and, as far s the *Reporter's* knowledge goes, is very free from disease of ny kind. The length of cane is all that could be desired at his season of the year, and planters everywhere are express- ng satisfaction with the condition of the crops. The plant anes are both thick and well advanced. B.6450 particularly s attracting attention. This cane is said to grow very apidly at this stage, and its vigour is conserved by its lmost absolute freedom from arrows.

Opportunity is taken to correct an erroneous statement n a previous report in regard to the variety Ba.6032 ending up spikey blades as though it meant to flower, but ctual flowering very seldom occurring. 'It is now quite vident,' says the *Reporter*, 'that this cane will arrow freely s a plant cane if planted early, and as a ratoon, when the ld crop is removed early in the reaping season.' This is aid to be the experience as regards both the black and the ed soils. The variety is spoken of by some planters as an xcellent and grateful cane.

The rains have been excessive for some of the lowlying elds of ratoons in the heavy soils. These had a late start nd were not strong enough to make headway against the xcessive moisture.

As the result of the heavy rains, cultivation is in backward condition for next season's crop. On several lays during the month of October no work of any kind ould be done, and this has considerably increased the ifficulty of subduing the rapidly spreading devil's grass and ther weeds. It is said that one factor that has contributed o backwardness in the preparation, is the shortage of labour n the cane fields, which made it necessary to utilize farm- abourers in the reaping of the crops. This also is said o have prevented a more extensive use of bush from the ullies and hillsides in the making up of pen manure by preading on cattle pens, or turning in direct to the soil as green dressing.

The new seedling canes B.6450., Ba.6032, and Ba.7924 re being advertised for sale at 30c. per hole, and B.H. 10 (12) t 50c. per hole or 75c. per 100. The last mentioned, it is tated, is a cane that does not arrow; it bunches well and tands up firmly.

THE SUGAR-CANE IN QUEENSLAND.

The Annual Report of the Bureau of Sugar Experiment Stations in Queensland is abstracted as follows in the *Experiment Station Record* (Vol. 35, No. 3.):—

This report reviews the progress of the cane-sugar industry of Queensland and the production of cane and sugar in 1915. The experimental work carried on at the Central Sugar Experiment Station at Mackay, the Southern Sugar Experiment Station at Bundaberg, and in other parts of the State, is briefly noted.

Experiments were conducted to determine the best system of treating ratoons. The different treatments included leaving the trash on the ground and allowing the cane to volunteer, burying the trash between the rows, shifting the trash in every other space between the rows and cultivating the cleared spaces, and burning the trash and opening the middles with plough and subsoiler to a depth of from 16 to 18 inches. Under the conditions of a severe drought, leaving the trash gave the best results, but the preceding year, when conditions were normal, burning the trash and giving deep cultivation, which is the station method, proved most profitable. It is concluded from the results that ploughing under trash in the ratoons does not pay.

The results of a variety test showed that Q.813 ranked first in sugar content followed by Q.990 and Q.137. Experiments with canes from the Queensland Acclimatization Society were continued, and the second ratoon crop was harvested. Badila Seedling and Hybrid No. 1 gave the highest percentage of pure obtainable cane sugar.

Different cultural methods compared resulted in the highest total yield of plant crop of 1914 and the first ratoon crop of 1915 on the plat giving cultivation with broad hoes, and on the one cultivated with a light drill harrow fitted with straight sharp tines. In a test to determine whether cane sets cut from arrowed canes have a prejudicial effect on the germination and subsequent yield, it was found that the cane from arrowed cane sets not only produced a greater stand of cane but also a greater yield

Analytical tests to determine the commercial value of a number of generally grown varieties showed that HQ. 426 and Badila gave much better yields of pure obtainable cane sugar than Goru, Cheribon, Malabar, and Otamite. Early or late planting apparently had no effect on the average sugar content of Cheribon, Malabar, and Otamite, while in the other three varieties, the late planting gave better average analyses. In a second test HQ. 426 and Badila also ranked first.

The Mackay station laboratory reported tables of analyses showing the quantities of lime, potash, phosphoric acid, and nitrogen removed in crops of cane of the weight grown. It was shown that more potash is removed than nitrogen, lime, and phosphoric acid.

At the Southern Sugar Experiment Station at Bundaberg, planting cane in rows 5, 6 or 7 feet apart showed that the closer planting produced the better yields. It was further found that planting tops only gave much better results than planting middles or bottoms and middles. The results of cultural tests were in favour of subsoiling, but the cost was too high to be profitable. Cane volunteered through trash, owing to a dry season, gave the largest margin of profit, but this method is not advised, as under normal conditions cultivation usually gives much better results. Analyses of burnt canes indicated that the cane did not depreciate to any extent during the first forty-eight hours, after which the glucose content began to increase rapidly until the tenth day, when it had increased almost twenty times as much as in the original. The loss in weight of cane and in the purity of the juice was also considerable.

WEST INDIAN FOOD SUPPLY.

THE PRICE OF FLOUR.

In connexion with the continued rise in the price of flour* letters were addressed by this Department to different West Indian Governments calling attention to the need for encouraging the cultivation of substitutes for wheat. Communications have now been received in answer to these letters, stating what action is being taken to safeguard the community in certain colonies. In St. Vincent the Government has caused the available storage room to be filled with kiln-dried corn, and it is stated that bin space can be provided at small cost, for 250 to 300 bags of corn, should this be necessary. The communication from St. Vincent adds that a good deal of locally grown corn is being sent to Barbados, which is regarded as being unwise in view of the present situation. The attention of planters is being directed to the matter in the press, and already two or three large growers of corn have erected bins to hold their produce.

In Montserrat the Government has drawn up a Circular letter, which has been printed and circulated to both large and small planters, informing them as to what are the circumstances of the situation. In addition it is intended to distribute posters calling attention to the high price of flour and to the importance, particularly as regards the peasants, of growing local substitutes. In Antigua it is understood that the Government has referred the matter to the Agricultural and Commercial Society which is taking the necessary action.

In answer to the letter addressed to the Government of Grenada, this Department has been informed that the Government of that Colony has taken action by getting into touch with the Agricultural and Commercial Society and the District Boards, with the view to getting the labouring classes warned and advised to plant ground provisions and as much corn as possible, so as to be prepared to meet the situation in the event of their finding it impossible to purchase flour. At the same time the clergy have been requested to urge upon the people the importance of planting provisions. Added to this the Agricultural Instructors have been directed to make the situation known as widely as possible, and to give practical encouragement to the planting of foodcrops by the distribution of seedlings and plants where necessary.

While the situation in regard to the price of wheat flour is not at present definitely alarming, it does call for a certain amount of preparedness, and from the above information it will be seen that the various Governments are quite alive to this fact. It is obviously important to take a matter of this kind well in hand at the earliest opportunity, belated action, however vigourous, being entirely without effect.

In connexion with the above article it may be noted that public attention has been called to the matter in St. Lucia and St. Vincent by the local press. The *Voice of St. Lucia* reproduces the substance of the editorial on West Indian Substitutes for Flour (*Agricultural News*, for October 31), while the St. Vincent *Sentry* after calling attention to the general features of the present situation reproduces, at the request of the Government, the Circular letter addressed to the Governments of the Windward and Leeward Islands, as mentioned above.

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*See editorial on 'West Indian Substitutes for Flour' in *Agricultural News*, for October 21; also article on 'Guinea Corn as Human Food', in the next column.

GUINEA CORN AS HUMAN FOOD.

As explained editorially in this Journal for October 2 the attention of various West Indian colonies has been call by the Imperial Department of Agriculture to the tende towards further rise in the price of wheat flour. It w suggested that efforts should be made locally to extend t area under such crops as will serve at least partially substitutes for flour, and in this connexion specific referen was made to Guinea corn (*Sorghum vulgare*)

Enquiries have since been received concerning t methods of cultivating this crop and the methods of prepa ing the grain as human food An attempt is made to supp the information in the present article.

In the first place it may be pointed out that the thr great advantages that Guinea corn possesses as a food cro are: (1) that it is very drought-resistant, and is therefo a more dependable crop than Indian corn (maize); (2) tha it possesses a high percentage of albuminoids, being high than Indian corn, and equal to wheat flour in this respec and (3) containing a low percentage of oil and moisture, keeps well.

These are obviously very important characteristics.

DIFFERENT VARIETIES.

There appear to be three principal varieties under cult vation in the West Indies: the ordinary native type; the re Guinea corn or Dhurra; and the Mazzagua Guinea corn. Jamaica the red Guinea corn has been found more drough resistant than the native type; while in St. Kitts, Mazzagu has been found to produce longer ears and larger grain.

A careful comparative study of the different types i needed.

CULTIVATION.

In Barbados, Guinea corn is planted in a similar wa to Indian corn, four seeds being placed in each hole.

Nicholls in his 'Tropical Agriculture' says the seed i sown in furrows, or drilled in 3½ to 4 feet apart. Th seedlings should be thinned so that they may be less tha 12 inches apart in the rows. This probably refers to th method of cultivation in Africa.

In St. Kitts, Mazzagua is planted about July or Augus on 3-feet banks, each seed 1 foot apart in the row.

PESTS AND DISEASES.

The principal objection to the cultivation of Guine corn is the loss of grain occasioned by birds. It has bee pointed out in Jamaica, that if Guinea corn were more gener ally cultivated, the loss would be distributed, and therefor felt less by the individual. Birds can be kept off to some extent by an image of cloth and paper, that is by the so-called 'scare-crow', according to experience in Jamaica. Guinea corn is also attacked by the corn ear worm (*Laphygma frugiperda*). The small grey moths infest the ripening heads of grain, sometimes completely spoiling them. This form of injury has been reported from Nevis in an experiment plot containing a very close-headed variety of Guinea corn. The only method of prevention in such a case as this is the cultivation of a kind with a very open head.

HARVESTING.

When the corn has arrived at maturity, which takes four to five months (Nicholls), or a little over three months

in the case of the Dhurra variety (*Journal of the Jamaica Agricultural Soceity*, XVIII, p. 344), or according to Shepherd (*Report of Agricultural Department*, St. Kitts-Nevis, 1913-14) five months for Mazzagua, it is harvested by cutting off the ears near the top of the stem, and then carrying them in baskets to the house or shed. The ears are kept in heaps for a few days, and afterwards they are spread on the floor of the building, and the grains are threshed out by means of a flail. Threshing may effectively be done by means of the machines used for threshing broom corn. Winnowing machines might possibly be introduced with advantage into districts where sufficiently large areas of the corn are under cultivation.

YIELD.

It is stated that 50 bushels of corn per acre may be considered a good average yield. The return per acre from plot experiments at St. Kitts with Mazzagua varied between 25 and 35 bushels per acre. In one of these trials, 'the plants grew to a great height, and the weight of the seed made the stalks bend over until they almost reached the ground.'

PREPARATION FOR FOOD.

While Guinea corn is used throughout the West Indies as stock food, both as regards the grain and the fodder, it is chiefly in Jamaica and Barbados that the value of the grain is appreciated as food for man. As already pointed out, Guinea corn, from a chemical stand-point, is a more valuable human food than Indian corn on account of its high nitrogen content, but it has colour and a certain distinctive flavour which would require getting accustomed to before it could be agreeably used as flour in the place of wheat. Moreover, Guinea corn flour cannot be used for making raised bread, due to the fact that gluten is absent from the protein in this grain. It might however be used in this way mixed with an equal quantity of wheat flour.

The customary way of using Guinea corn in Barbados is in the form of a meal. The threshed grain is screened and ground up in an ordinary hand mill like a coffee mill, such as is employed in the case of Indian corn. As already intimated, Guinea corn meal has one great advantage, in that it keeps well.

As regards preparation for table consumption, the most common dish containing this meal is cous-cous, prepared in a similar way to maize cous-cous. There would seem to be no valid objection to employing Guinea corn in making cakes and biscuits, and, as already mentioned, mixed with wheat flour, in making bread In Jamaica, Guinea corn flour is used for making porridge.

This article may be concluded by quoting the following remarks from *Farmers' Bulletin* (No. 686, United States Department of Agriculture) on the uses of sorghum grains. This says: 'A varied diet is desirable. Sorghum grain can be and should be used as human food Doubtless it will be used to some extent whenever it can be produced and sold at a figure which will make it profitable to dealer and consumer alike.'

This refers to the United States. The idea in the West Indies is not to grow Guinea corn primarily as a cash crop, though this might prove remunerative, but rather as an emergency crop to take the place especially in the poor man's dietary, of an imported article of food, of which the price is continuing to show a steady tendency to rise.

Cassava Flour.—Mr. W. Robson, Curator of the Experiment Station, Montserrat, has furnished this Office with a sample af cassava farine prepared in that island. The farine is a dry crisp meal and has the important characteristic of keeping almost indefinitely. On the snbject of cassava farine, the *Journal of the Jamaica Agricultural Society* (Vol. XVIII, p. 512) says that where there is any difficulty in selling cassava roots promptly and profitably, they should be made into farine. It correctly describes the farine as looking like coarse oatmeal, while it is almost as palatable. From a chemical stand-point farine has not a very high food value on account of the small percentage of protein it contains. Consumed, however, with more nitrogenous food such as beans and peas, it should be very valuable. It is stated to be more digestible than wheat flour or corn meal, for in the ordinaay process of manufacturing, which is simply heating the grated cassava (after the juice has been pressed out as in making cassava cakes) on a hot plate, a large proportion of the starch is transformed into dextrin. This change is similar to what takes place when a slice of wheat flour bread is made into toast. From a general point of view properly made cassava farine should prove a useful substitute for some of the wheat flour which is at present consumed in these islands.

A copy has been received of the Annual Report of the Board of Agriculture of the Bahamas, for 1915-16. In this it is stated that there is a marked improvement generally in agriculture to be reported for this year owing to various causes, among which are generally speaking good rainfalls, inclination, to return to farming on account of the war conditions and the continued encouragement given by this Board both educationally and practically to the small farmers. This is shown by the increased exports of farm and plantation products, as well as by the improved supplies in local markets. The experiments carried out last year by the Board to demonstrate the possibility of growing Sea Island cotton in the Colony have not proved a success both on account of local conditions and low market values in England. They have therefore been discontinued, and the cultivation of this product this year must be reported as very small.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on November 8 by the S.S. 'Guiana' for a short visit to Antigua with the object of conferring with the Governor of the Leeward Islands on certain official matters connected with that Presidency. Dr. Watts returned to Barbados by the C.R.M.S. 'Chaudiere' on the 15th instant.

Mr. W. Nowell, D.I.C., Mycologist on the Staff of the Imperial Department of Agriculture left Barbados on November 16 by the C.R.M.S. 'Chaudiere' for St. Vincent, with the object of continuing investigations in that Colony in regard to diseases of cotton. Mr. Nowell is expected to return to Barbados on November 29.

COTTON.

SEA ISLAND COTTON MARKET.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 16, 1916, with reference to the sales of West Indian Sea Island cotton:—

Since our last report only a few odd lots of West Indian Sea Island cotton have arrived, which have been sold at prices varying from 14*d.* to 21*d.*

P.S.— Sakel Egyptian has advanced very rapidly, and the best quality is worth 23*d.* to 24*d.* We are afraid this will not be maintained, but if it should be, good clean West Indian should be easily worth the same price.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 14, 1916, is as follows:—

ISLANDS. Receipts for the week were 80 bales, and total to date 176 bales. Factors are not as yet offering their receipts, nor naming prices, preferring to delay doing so until the movement is larger. The market, therefore, has not yet opened, and we are unable to give quotations.

GEORGIAS AND FLORIDAS. The demand has been very general with advancing prices, taking all offerings both in Savannah and at all interior points. Consequently the market closed strong on a basis of Extra Choice 38c., Fancy 39c., with Factors unwilling sellers except at a further advance.

The buying has been general on account of Northern and Southern Mills as well as on speculation, resulting in an advance of over 3c. during the week. Notwithstanding this, there is a general feeling that prices will advance further, which encourages speculation and parties having stock on hand to ask higher prices.

The future of prices will depend on the ability of the mills to sell their production on a basis of the high prices current.

We quote, as follows: —

GEORGIAS AND FLORIDAS.

Fancy	38½c. to 39c = 40c to 40½c.	landed
Extra Choice	38c. to 38½c. = 39½c. to 40c.	,,

with Factors holding higher.

The exports from Savannah for the week were, to Liverpool 250 bales, Northern Mills 4,284 bales, Southern Mills 369 bales, and from Jacksonville to Northern Mills 2,211 bales.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and fifty-second meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, October 3, Mr. W. S. Kinch occuping the Chair.

Interesting facts were brought forward, though largely in relation to a different type of cotton to that produced in the West Indies.

WEST AFRICA. The purchases of cotton in Lagos to September 23 amount to 9,198 bales, as compared with 5,852 bales for the same period of last year, and 13,486 bales for 1914.

The purchases of cotton in Northern Nigeria to August 31, amounted to 10,522 bales, as compared with 531 bales to August 31, 1915, and 518 bales for 1914.

There has been considerable difficulty in shipping cotton from West Africa, but through the kind offices of the Government, and of the West African merchants, arrangements have been made for the Association to be given preference in respect of shipments of cotton, but not of cotton seed. As a result of these arrangements, shipments are now coming forward more satisfactorily, and it is anticipated that the whole of last season's crop will have been shipped to Liverpool by the end of March next.

Various reports have been received dealing with the increased quantities of cotton produced in the Zaria District during the past season. The Director of Agriculture for the Northern Provinces states that it is certain that more than one factor was responsible for the large influx of cotton at Zaria from January to March last, the chief causes being:—

A. The plentiful rains of 1915 resulted in an abundant harvest, causing the local value of all produce to fall considerably, but the Association maintained a minimum price of 1⅛*d.* per lb. for cotton and consequently the bulk of the crop was sold to them.

B. The lower prices offered by merchants for ground nuts consequent upon the war accentuated the local fall in values, and resulted in there being less money available in the North for purchasing Zaria cotton.

C. The increased use of cotton goods of English manufacture in the districts served from Kano is gradually resulting in a reduced local demand for raw cotton.

D. The constant demand maintained for cotton on a cash basis by the Association during the past five years has not been without its effect on the natives' minds, though the poor crops of 1913 and 1914 have hitherto prevented this fact from becoming apparent.

The only serious competitor of cotton as a cash crop in the Northern Provinces is ground nuts. The labour in growing and marketing an acre of ground nuts is considerably more than that involved for a similar area of cotton, and at £10 per ton the cash return is also more. The complexion of things, however, is entirely altered when the price of ground nuts (decorticated) drops to its present level of £5 per ton. The whole question resolves itself into one of making the crop as remunerative as possible, and this can best be achieved by subsisting an improved variety of cotton for the one now generally in cultivation, and so increasing both the yield per acre and also the price per lb.

The present season's crop so far promises to exceed the past one, both as regards the ordinary native crop, and also in respect of the improved varieties of long staple cotton.

UGANDA. There is a considerable accumulation of baled cotton in the interior of Uganda owing to the shortage of available steamers on the lake, and the delays on the Uganda railway. This is a very serious matter, as it involves a considerable amount of capital being locked up in cotton The question has been taken up with the Government, and there is reason to believe that the position will shortly improve, and that the cotton will all be cleared for shipment in about two to three months' time.

The reports regarding the growing crop in Uganda continue satisfactory, and it is estimated that the crop will amount to about 40,000 bales, which is about the same figure as in the year prior to the war.

NYASALAND. It was reported that the acreage under cotton grown by Europeans is the largest yet planted in the Protectorate, namely 29,578 acres as compared with 24,006 in the previous year. With regard to the European crop prospects, lower temperatures during the month of March have seriously reduced the crop in the Highlands, and the Luchenza crop was severely attacked by insects. The prospects on the Lower River are considerably above the average and showed marked improvement on last year, but even allowing for good crops in this area, the output per acre from the total European acreage is likely to be below the average.

As regards the native cotton crop, the distribution of seed to natives was never larger than in the present season, and as the greater part of the crop is grown in the warmer districts, it has not suffered to the same extent as the European crop on the Shire Highlands. The native crop should give a total somewhat similar to 1913-14, when the record native crop of 1,198 tons of seed-cotton was harvested. This would be a most satisfactory result, considering the great demands on native labour for military transport, and the reduced staff of the Agricultural Department for a general supervision of the crop.

A USEFUL FUNCTION OF BOTANIC GARDENS.

In his letter of transmittal to the Report on the Agricultural Department, Dominica, for 1915-16, the Imperial Commissioner of Agriculture refers as follows to the scheme of instruction carried out in the Gardens:—

'The instruction of pupils at the Botanic Gardens continues to be carried on in a satisfactory manner. To show the nature of the field work done by the pupils extracts from the diary of one of them are reproduced in the present publication, as well as the report on the work, by the Hon. J. C. Macintyre. These statements make it evident that the work done is of great practical value both to the pupils, and to the Presidency.'

The extracts referred to are given below in order that the general reader may obtain some idea as to how Botanic Gardens and Experiment Stations may be utilized for the purpose of giving sound practical instruction, fitting the pupils for positions on estates afterwards. It should be added that the pupils receive theoretical instruction each Saturday, and they are also periodically examined by the Imperial Department of Agriculture.

The diary runs as follows:—

April.—Pruning lime trees in the new Lime Experiment plots in the valley. Opening holes for lime plants; preparing rosin compound, and spraying nurseries. Tapping Castilloa rubber trees; tarring posts for fences.

May.—Spraying citrus and ornamental plants; preparing insecticides; sowing cacao seeds; preparing bamboo pots; pruning cacao trees. Topping hedges; pollinating vanilla flowers; collecting material for mulching cacao plots.

June.—Preparing for application of manures to cacao manurial plots at the station, weighing different manures per plot, and per tree. Applying manures. Gathering seeds of green dressings; budding lemons on sour orange stocks. Pruning cacao trees; applying manures to lime experiment plots; tarring gates in experiment plots; picking cacao and removing suckers.

July.—Sowing lime seeds. Planting cuttings of shade trees; sowing seeds of green dressings through coco-nut plot. Topping hedges; applying manures; tapping Castilloa rubber trees; preparing insecticides, and spraying nurseries.

August.—Lining out for planting lime plants in new Experiment Station. Spraying lime plants; picking and suckering cacao; preparing a fungicide and applying to seedling limes. Potting cacao seedlings; spraying lime plants and transplanting lime seedlings; preparing stock solution of rosin compound; budding lemons on sour orange stocks; applying lime to heavy land.

September.—Transplanting lime seedlings; sowing seeds of green dressings in the nursery; trimming hedges; spraying lime seedlings; suckering cacao; potting cacao seedlings. Preparing Bordeaux mixture; planting lemon grass on poor soil to produce mulch for experiment plots. Dressing cacao trees for 'canker'. Poisoning wood-ant nests in cacao cultivation. Preparing seed boxes and sowing seeds.

October.—Potting cacao seedlings. Sowing seeds of green dressings, suckering cacao and treating wounds on cacao trees with tar. Weeding and mulching young coconuts. Tarring posts exposed to weather. Surveying and enclosing two new cacao manurial plots; mulching Para rubber trees; preparing bamboo pots; removing moss and other epiphytes from citrus trees. Mulching young limes planted in experiment plots. Lifting and transplanting sour orange stocks for budding. Tapping Castilloa rubber trees; transplanting lime seedlings.

November.—Transplanting lime seedlings; sowing seeds of tangerine, mangoes, and avocado pears. Weeding borders and trimming hedges. Picking vegetable seeds; potting cacao seedlings. Planting hedges of Acalypha. Planting cuttings of *Gliricidia maculata.* Picking and suckering cacao. Weeding green dressing plots.

December.—Transplanting lime seedlings; sowing seeds of ornamental plants in boxes; preparing stock solution of kerosene emulsion; spraying limes and cacao. Potting cacao seedlings. Picking cacao; sowing lime seeds in beds; weeding lemon grass plots; spraying cacao for attack of thrips. Sowing cacao seeds. Poisoning wood-ant nests.

January.—Pruning dead wood in lime trees. Suckering and picking cacao. Preparing stock solution of kerosene emulsion; spraying limes and cacao. Weeding green dressing plots. Preparing seed boxes and sowing lime seeds. Tapping Castilloa rubber trees; sowing seeds in boxes.

February.—Transplanting lime seedlings. Sowing lime seeds. Picking and suckering cacao. Gathering seeds of green dressings. Preparing stock solution of rosin compound.

March.—Transplanting lime seedlings. Dusting lime seedlings with sulphur and lime. Applying manure to cacao. Spraying citrus nurseries. Sowing lime seeds; trimming hedges; mulching and spraying young limes in new experiment plots. Preparing seed boxes and sowing cacao seeds. Pollinating vanilla flowers. Preparing stock solution of 'scalo'. Pruning lime trees in the Experiment Station.

Record Shipment of Lime Juice Products from Dominica.—One of the heaviest shipments of lime juice products made from Dominica went forward in the S.S. 'Savan' which left Roseau for London on October 27. It consisted of 244 hogsheads and 939 casks containing 49,760 gallons of concentrated lime juice, 234 drums, 30 pipes, 361 puncheons, 116 hogsheads and 214 casks containing 88,680 gallons of raw juice. The shipment also included 646 cwt. of citrate of lime, and packages containing 890 gallons of distilled oil and 170 gallons of hand-pressed oil.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

Some of the reasons why the employment of motor cultivation in the West Indies should be given greater attention are set out in the editorial to this number.

On pages 372 and 373 will be found information pertaining to the situation that has arisen on account of rises in the price of flour.

An interesting note on the importance of light in the germination of seeds appears on page 377.

On page 381 the working of the St. Vincent Government Granary and of the Anderson Oil Expeller of St. Vincent are described.

A note on the breeding and feeding of pigs is given on page 383.

West Indian Archæology.

A review appears in *Nature* for September 28 of T. A. Joyce's 'Central American and West Indian Archæology' (London: Philip Lee Warner. Price 12*s.* 6*d.* net). The last hundred pages of the book are devoted to the West Indies, and while the matters dealt with are not directly pertinent to agricultural affairs, they are of sufficient scientific interest to justify reference in these columns.

It is stated that the original stock of the whole Archipelago were Arawaks from the Northern Continent, and were in turn followed by the more bellicose Caribs, who at the time of their discovery were in possession of the Lesser Antilles and fast extending into some of the greater islands. They had a patriarchal system, with caciques or small chiefs. A tie of friendship was the mutual exchange of their names. They practised the couvade. The Arawaks were armed with sword-clubs and javelins hurled by means of ornamented spear-throwers. The chief weapon of the Caribs was the bow. The male prisoners were eaten. There is no evidence that stone weapons were used, the blades of stone found being tools. Charms were made of wood and stone, images of man and animals. Interesting are the stone collars which are said to be the translation into stone of originally a wooden hoop, a tree fork bent and fixed by bandages into this shape. It is said that the enclosing of a spirit in such a circle is connected with tree worship. This book should be read by West Indians interested, as many are, in Carib implements.

The Importance of Scientific Research to the Industries.

According to C. A. Jacobson, of the University of Nevada, the popular attitude of mind towards the value of scientific research is the same in the United States as it was in Great Britain before the war. Writing in *Science* (September 29, 1916) he says: 'As a nation we are not sufficiently appreciative of the value to industry of research in pure science. In order to credit certain experimentation, we must see a well-established connexion between the work in hand and the end sought. A clear and definite series of results pointing toward a certain conclusion must be produced before we are in a mood to consider the possible importance of the investigation.'

The article goes on to state that few of the American manufacturers have realized the significance of a well-equipped research department in connexion with their industries. 'This statement, however, does not refer to the testing laboratory, whose value has long been recognized and has its place in the factory.'

In the West Indies one cannot help noticing the fact that a similar attitude of mind prevails. The general public has little sympathy with scientific research, though every planter recognizes the value of a testing laboratory in sugar factories, while the Administrations even have advanced so far as to support analytical work in connexion with milk supply and allied matters pertaining to the maintenance of public

health, and security from fraud. But as the writer quoted above infers, this is not science in the sense of that investigation which leads to discovery; it is merely the most elementary chemical manipulation borrowed from science for legal or commercial purposes.

The article shows how great industries have arisen as the result of the pure research of a few pioneers, research that has been carried on without any utilitarian ideas whatsoever. Reference is made to the photographic industry, the electro-chemical industries, and the more recent artificial production of nitric acid in Germany as the outcome of the research of Haber.

A suggestion is made in the article to the effect that the State should step in and organize industrial research just as it has done in connexion with agricultural research work. When that is done it is believed that the United States will attain to a position of such economic power as to render her commercially secure from any other nation in the world.

The Effect of Light on the Germination of Seeds.

An interesting publication dealing with the germination of seeds has been issued as *Bulletin 159* of the Agricultural Experiment Station of the University of Minnesota. It is stated that practically all the grass seeds and some of the flower seeds dealt with during 1914-15 were tested in a sunlight germinator. It has been found that many of the grass seeds germinate best in the light. The results obtained from this germinator have been very promising and experimental work will be continued in the hope of determining more accurately the real advantage of light germinations. In connexion with the same subject, a note in the *International Review of the Science and Practice of Agriculture* for April 1916 is of even greater interest. It is concluded, as the result of careful investigations, that blotting paper is the best medium for the germination of most Gramineae. Contrary to the opinion of Nobbe, light is absolutely indispensable to the germination of certain species. A change of temperature from 20° to 30°C. (20° for eighteen hours and 30° for six hours) has proved favourable in many cases. A constant temperature of 20°C., with absence of light is favourable to very few species. A constant temperature of 30°C. is unfavourable to most species. It is believed that in the case of several species of grass, the germination faculty should be studied under different sets of conditions.

Studies on light and temperature as related to the germination of seeds have been conducted with nine species of Onagraceae, one of Hydrophyllaceae, and two of Scrophulareaceae. It is stated in the *Experiment Station Record* (Vol. XXXV, No. 3) that in the first group, three different germination types may be distinguished as regards their relation to light and temperature. The second division is characterized by a low germinability optimum and by the injurious action of high germination temperatures, the favouring action of temperature change, and the unfavourable action of light at extreme germinating temperatures. In the third group, the seeds require stronger light at low temperatures. Temperature variations also favour germination, especially when regular, giving the most marked results when the lower daily temperatures were maintained for longer periods than were the higher temperatures.

Agricultural Development in Federated Malay States.

As will be observed from an article in the *Chamber of Commerce Journal* for Septenber 1916, Mr. E. S. Hose, Acting Director of Agriculture, has written an interesting report on agricultural development in the Federated Malay States in 1915. Although rubber cultivation reaches its highest point of excellence on the plantations of Malay, Mr. Hose does not confine himself to rubber planting only, but ranges over a wide field of tropical agriculture, and the possibility of introducing new forms of cultivation into the Malay States.

Among the products that have received the attention of the department during the year under review were, the African oil palm, camphor, cinchona, tea, coffee, ipecacuanha, cotton, fibres, wild ginger and cardamoms for paper making, croton oil, eucalyptus, cocaine, Brazil nut, date palm, ground nuts, etc. It is stated that in a field near the department at Kuala Lumpur, a number of oil palms in bearing for the past two years gave a yield of from 35 to 45 lb. of nuts each palm per annum. Cinchona did well in Gunong Angsi at an elevation of 1,000 feet, and about 2 acres of tea have been planted at about 2,500 feet on Gunong Angsi, and the growth so far has been excellent.

Statistical tables appended to the report show the agricultural acreages of the Federated Malay States alone, on estates over 100 acres in extent, in 1915, to be as follows: rubber 499,479, coco-nuts 54,822, coffee 4,312, other cultivations 1,234, making a total of 559,847 acres. Excluding the Straits Settlements (from which the statistics had not come to hand when the report was written) but including other States of the Peninsula under British protection, there were, at the end of the year, 703,535 acres under rubber on estates of 100 acres and over; 82,250 acres under coco-nuts; and 6,085 acres under coffee. The export returns of the Commissioner of Trade and Customs show that 44,523 tons of rubber were exported from the F. M. S. in 1915. Mr. Hose concludes that the total rubber export of British Malaya is over 68,000 tons. From the stand-point of market prices, producers of plantation rubber have little cause to complain of the position of the industry during the year 1915.

Among the more important problems of the rubber industry in Malaya that are said to call for immediate attention are, briefly—(1) the combating of fungus pests on older estates ; (2) the consideration of methods of coagulation in view of the almost prohibitive price of acetic acid ; (3) the adoption of such methods of treating rubber as will result in a uniform rate of vulcanization, or, in other words, in the standardization of plantation rubber.



INSECT NOTES.

METHODS OF CONTROLLING WHITE GRUBS IN AMERICA.

The records of investigations on the white grub (*Lachnosterna* spp) in Wisconsin, abstracted in the *Review of Applied Entomology* (Vol. IV, Ser. A, Part 7), are of interest in connexion with the efforts to control this pest in the West Indies. Collection of the adults appears to be the most effective method of control, and the statements regarding the situation of the traps in regard to light, etc., should be noted.

In the experiments carried out in Wisconsin in 1914-15 in connexion with *Lachnosterna*, the factors considered were: (1) the determinations of conditions; (2) the crops most seriously damaged with and without rotation; (3) the species present and the habits, life-history, distribution and means of control. Lantern traps were used to collect the beetles. They consisted of the Coleman gasoline arc lantern, from 300 to 400 candle power, set into galvanized refrigerator pans, 5 inches deep and 24 inches in diameter. The pans were filled about two-thirds full of water and ½ pint kerosene was poured on this and renewed when necessary. Perforated skimmers were used to remove captured insects. Results were obtained relating to the distribution of species over a comparatively limited area, the optimum temperature for flights, and the most favourable location and arrangement of light traps. Seventeen out of the nineteen species known to occur in Wisconsin were taken in the traps. *L. fusca* was most widely distributed and dominant at Lancaster and Dodgeville. *L. rugosa* was dominant at the north-east stations, and L. *implicita* at Ripon. Males only of *L. gibbosa* and *L. nitida* were attracted to the lantern, and *L. tristis* only to a slight degree Several species disappeared at the stations furthest to the north-east, while *L. rugosa*, *L. dubia*, and *L. grandis* increased in numbers. *L. dubia* emerged very early, before May 21 at Dodgeville, and to the extent of 92 per cent. before this date at Baraboo. Flight was found to cease almost entirely at 62° F. Large pans were found to be desirable; the number of beetles caught in a pan placed by the side of the central pan towards the origin of flight was twice as great as in a pan placed behind the light. At the Lancaster station flight was always from the north-west towards the south-east. Traps near the margin of woods or close to a fringe of trees were most successful. At Lancaster, more than 440,000 beetles were taken during the summer, and the maize crop was not noticeably injured. The smallness of the damage may have been due to the destruction of many beetles by diseases, and the frequent and heavy rains. The cost for fifteen light traps was from 1*s.* to 1*s.* 3*d.* a day. The numbers of males caught exceeded the number of females. This is the normal condition, and if, as has been suggested, the beetles are polyandrous, there may be an advantage in catching a larger number of males. Females of the more common species formed a larger percentage of the catch in the early part of the season than did males.

In the biological experiments undertaken to investigate the habits of white grubs, glass cages were used in which earth was placed between two vertical glass plates less than ½-inch apart. The cages were shielded from the light except at the moment of examination. By regulating the distance between the plates larvae of any size could be viewed from at least one side. The results were as follows: (1) No daily migration was observed; movements and feeding occurred only in warm weather, activity reaching a maximum during the heat of the day; the optimum temperature was between 60° F. and 65° F. (2) The food apparently consisted entirely of the roots of plants. (3) Larvae were reared from May 5 to July 18 in soil without apparent food; the soil was then allowed to dry, and on October 22 two larvae were alive and active, starvation methods for control are therefore useless. (4) Poisoned bran mash was not eaten by the larvae and was thus of no value. (5) Sodium arsenite, into which grass roots were dipped before planting, resulted in the death of 22·2 per cent. of larvae in four days; no injury to the grass was observed. Corrosive sublimate used on one plant caused a mortality of 50 per cent., but the plant died, since the roots were entirely eaten. (6) Kerosene emulsion and Black Leaf 40, at the ordinary strengths, were useless. (7) Creosote acted as a repellent and did not injure the treated plants. In the control pots a mortality of 15·9 per cent., due to bacterial and other diseases, was observed. Results in connexion with temperature and nature of food supply seemed most significant.

THE DEVELOPMENT OF RHODESIA.

Information of interest to the West Indies is from time to time derived from agricultural activities in Rhodesia, and it will perhaps prove instructive to give an account of the general agricultural conditions in that country. These are well described in a paper on the Development of Rhodesia from a Geographical Stand-point, appearing in *The Geographical Journal* for October 1916.

The stock-raising, agricultural, and horticultural industries of Rhodesia have hitherto been mainly confined to regions situated on the plateaux at an altitude of not less than 3,500 feet. Nothing has as yet been done to develop those portions of the territory which, owing to their low elevation, possess a more tropical climate Agricultural development is moreover, for the present for obvious reasons, practically confined to districts which are situated not more than 25 miles from a railway. Stock-farmers can, of course, go further afield.

Both Northern and Southern Rhodesia are first-rate stock countries, but the extent of the areas in Northern Rhodesia suited for stock-raising is necessarily limited by the distribution of the tsetse fly. Fortunately the Barotse Valley on the upper Zambesi and the Middle Kafue are both free from fly, and are capable of carrying very large herds. In Southern Rhodesia the best cattle districts for ranching purposes are to be found in Matabeleland, which in Lobengula's time was heavily stocked. Mashonaland is also a good cattle country, but owing to its higher rainfall it is generally more suitable for the fattening of stock and dairying than for ranching.

The chief grain centres of the territory occur in Southern Rhodesia, in the vicinity of Salisbury, notably on the Gwebi Flats, and in the Mazoe Valley, and in the Victoria District. In Northern Rhodesia the best grain districts are to be found in the Kafue neighbourhood. Maize

is the staple crop grown by the Europeans, but rice and various varieties of millet are produced in great quantities by native cultivators. Ground nuts and sun flower seeds are beginning to be produced on an increasing scale for the manufacture of oil. Tobacco grows everywhere, but its success from a commercial stand-point entirely depends on cost of production. Its prospects in Mashonaland, and in the vicinity of Fort Jameson are encouraging. It is probable also that in a few years' time Southern Rhodesia will export citrus fruits on a large scale to Europe. Apples have been tried with varying success, and may in time succeed in the vicinity of Inyanga.

Owing to the distance which intervenes between Rhodesia and the markets of the Union, Rhodesia has already been compelled to face the problem of export and to promote co-operation between producers with this object. A large tonnage of maize has already been exported. Considerable quantities of tobacco have been sold on the London market, and experimental shipments of oranges have been made successfully. The export of meat and other cattle products is receiving attention, and one looks forward with confidence to the day when Rhodesian chilled meat will be exported to this country via one of the West Coast ports. But before this can occur large herds must be built up and the standard of local cattle improved. This will take time, but meanwhile there is every reason to expect that a considerable export of canned meat will take place, and possibly also of dairy products.

So far reference has been made only to the possibilities in more elevated regions. In the future when the Salisbury Railway reaches the Zambesi, there is little doubt that a number of valuable products of a more tropical character, such as cotton, sugar, sisal and other fibres, rubber, and oil seeds, will be raised by planters in the lowlying regions which abut on the Zambesi and Laungwa Rivers and their tributaries.

As regards wild rubber, a number of rubber-producing plants of the genus Landolphia are met with over considerable areas in Northern Rhodesia. They include several species of rubber vines and of bushes which produce root rubber The quality of rubber produced is excellent, and the payability of the industry depends entirely on the density of distribution of plants and the cost of transport. The British South Africa Company has established a steam factory, at Chambesi, which started work just before the war broke out but which, owing to the shortage of labour brought about by the military operations on the Northern Border, has been temporarily closed down. It had, however, been at work sufficiently long to enable samples of the product to be sent home and to supply data in regard to costs of production. As the result of this preliminary information, it may be stated that the production of rubber is likely to become one of the staple industries of Northern Rhodesia.

Experimental Work in Bombay.—We have been furnished with two annual reports on experimental work at agricultural stations in Bombay. In regard to that dealing with the Nadiad Agricultural Station, reference may be called to the experimental work with cotton in which considerable attention has been given to Cambodia Concerning oil seeds the yield per acre of a number of varieties of castor seeds is given together with the percentage of oil. The results of selecting castor seed are also given. The second publication describing work at the Surat Station deals with experiments with cotton, oil seeds (ground nuts), and certain manurial experiments.

CONCENTRATING LIME JUICE BY FREEZING.

An interesting piece of investigation, which may lead to results of practical importance, has been carried out by the Agricultural Department, in Dominica. During 1915-16, the Commissioner of Agriculture for the West Indies brought to the notice of the Dominica Department an interesting article on the concentration of cider by freezing, which appeared in the *Year-Book* of the United States Department of Agriculture for 1914 In this experiment it was shown that it was possible to concentrate cider by this process to one-fifth of its bulk without altering its properties as a beverage.

It was suggested that experiments be conducted to determine the behaviour of raw lime juice when treated in a similar manner. It is obvious that if raw lime juice, which is shipped for cordial purposes, could be concentrated without changing its essential properties, there would be a very considerable saving in freight, packages, and other charges.

The phenomenon that solids in solution can be concentrated by freezing the liquid and removing a portion of the ice formed has been known for a long time, and in the reverse way this has often been made use of in obtaining drinkable water from sea-water. In this case it is the frozen portion which is saved, the amount of sodium chloride which it contains being so small as to make it moderately drinkable.

Numerous experiments were conducted during 1915-16 to ascertain how lime juice behaves on freezing, and the results obtained are discussed in the Report of the Agricultural Department, Dominica, for 1915-16

The raw lime juice throughout the experiments was placed in a receptacle of block tin or a glass jar, which was packed round with a freezing mixture of salt and ice, which reaches a temperature of between – 5° and – 10° C. In a short time the juice becomes cooled to a temperature of between – 1° and – 2° C. Shortly after it will be found that ice has separated on the side of the jar, and on continuing the process this layer gradually thickens until later a core of juice remains and finally a solid mass is formed.

The sides of the receptable are now warmed, and the solid mass slips out on to a basin where it is cut up with a knife into pieces of suitable size to enable their being readily placed inside the basket of the centrifugal machine.

The centrifugal is whirled round for a few minutes and throughout these experiments the whole was melted in stages of known volumes.

The capacity of the centrifugal machine was such that only 500c.c. of juice could be conveniently handled

The general conclusions arrived at are given in the Report, and are as follows:—

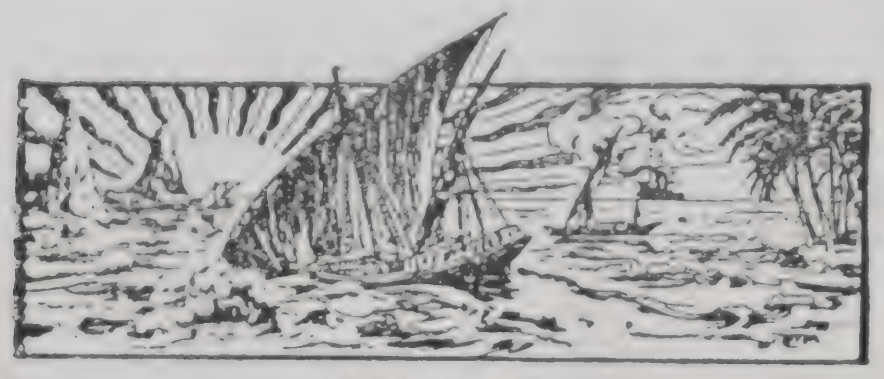
1. Raw lime juice when frozen and treated in the centrifugal can be concentrated without affecting its properties as a beverage.

2. If the juice is treated once only, the acid content may be increased from about 13 oz. per gallon to over 20 oz. per gallon.

3. If this be refrozen a juice containing 30 oz. per gallon can be obtained.

4. The low testing juices can be converted into citrate of lime, thus eliminating all losses excepting those of handling.

5. This process enables a very considerable saving to be made in freight, charges, and packages, amounting to between 40 and 60 per cent., the actual amount depending on whether the juice is frozen once or twice.



GLEANINGS.

Statistics of coco-nut cultivation in the Malaya Peninsula show that there were 82,250 acres under coco-nuts in 1915, exclusive of the Straits Settlements. The area for the Federated Malay States in 1915 was 54,822 acres, as against 58,027 acres in 1914.

Bulletin No. 212 of the Agricultural Experiment Station, Kansas, deals with the subject of Soudan grass. It is stated that this grass makes a very palatable hay and that feeding results have been uniformly good. Soudan grass promises to replace a considerable portion of the millets and sorghum sowed for hay purposes in Kansas.

In connexion with the information given in recent issues of this Jourual as to the control of the house fly, it may be noted that *Farmers' Bulletin No. 734*, United States Department of Agriculture, deals with fly traps and their operation. Different kinds of traps are illustrated, special ones having been designed for manure heaps.

Infectious abortion in cattle is dealt with in *Circular No. 29*, Michigan Agricultural College Experiment Station. It is considered possible that calves may become infected through milk from infected animals. Certain results tend to indicate that children or adults may be affected by the consumption of raw milk containing the abortus bacillus.

Farmers' Bulletin No. 715, United States Department of Agriculture, deals with the measuring and marketing of woodlot products, and should prove of interest to forestry and land settlement officers in the West Indies. A section is devoted to cordwood, and rules are given for the measurement of timber that has been felled, and for the estimation of standing timber.

An article in the *Empire Review* on the romance of logwood states that the logwood tree is ripe for cutting in ten to fifteen years, although sometimes it is as well to leave it to mature for a longer period. The outer layers of the wood are white, soft and worthless for any purpose other than the fire. No special machine has yet been invented for removing this outer wood.

The development of rubber cultivation in Burma has been very considerable during the last five years. According to the *India Rubber Journal*, 310,240lb. of rubber was exported in 1911-12, but this gradually rose to 1,285,984lb. in 1915-16. Experience shows that large areas in Burma are suitable for rubber cultivation, and it is considered that an estate in full bearing should yield not less than 350 to 400 lb of rubber per acre.

Under the heading of Three Types of Commercial Vanilla in Tahite, the *Experiment Station Record* for August 1916, notes that the type called Mexican vanilla is *V. planifolia*, and that the type called Tahitan vanilla is closely related thereto, but that the type which has been provisionally called *V. tiarei*, and which is thought to have appeared there five or six years ago from an unknown source, may be a variation or a hybird. It is said to possess qualities of commercial value.

Several experiments have been carried out in Burma, in association with the Imperial Institute, with a view to the production of Tepary beans, which are more suited to the United Kingdom market than those usually grown in Burma. This bean is chiefly grown in the Southern States of America, and in Mexico. The beans grown in Burma have been proved to possess a high food value and have given good yields. It is expected that Burma will export considerable quantities of this bean in the near future.

Two main series of experiments have been conducted with dynamite in Dominica, (1) to determine the effect of explosions of the soil among established lime trees, and (2) to determine the effect of using dynamite in making holes for planting. After a period of two years, it is stated, in the report of the Agricultural Department, that no advantage is to be observed in the treated trees in the first experiment, and the dynamited rows show no advantage whatsoever over the ordinary spade-made holes.

The *Incorporated Chamber of Commerce of Liverpool Magazine* for August 1916, contains a report of the annual meeting of the African Trade Section. This is of interest in connexion with the deflection of trade in oil nuts from Germany to Great Britian owing to the war. It may be noted that oil nuts are the source of glycerine which finds an important use in the manufacture of high explosives. Vegetable margerine for human consumption is also prepared from palm kernel oil, but the most important commercial product is soap.

According to the *Experiment Station Record*, feeding experiments have been described in which laboratory animals (dogs and hens) were given bread made from mixtures of finely ground seaweed and wheat, rye, and potato flour. During baking the characteristic odour of the seaweed disappeared, and the bread was found to possess good qualities. In another note in the same publication the composition of seaweed is given as follows: protein from 5 to 6 per cent.; fat from 0·9 to 2·2; starch from 8·4 to 13·9; crude fibre from 5·4 to 6·4; ash from 18·3 to 23·4; and potassium chloride from 2·5 to 6·3 per cent. The material is found desirable as a supplementary feed for poultry, growing swine, and horses.

The subject of nitrogen bacteria and legumes is dealt with in *Bulletin No. 94* of the University of Illinois Agricultural Experiment Station. The Bulletin clearly shows the importance of bacteria to legumes, one of the most convincing pieces of evidence being that shown in Plate I, where red clover is seen to be undeveloped in a sterilized soil containing no nitrogen, while in an unsterilized soil containing no nitrogen the growth is luxuriant. The investigations also furnish conclusive proof that infected sweet clover soil can be used for inoculating alfalfa fields. It appears that proper inoculation is important for the cultivation of the soy bean.

THE GOVERNMENT GRANARY, ST. VINCENT.

The rules for the purchase of corn by the Government Granary in Antigua were published in the *Agricultural News*, Vol. XIV (1915), No. 341, p. 169. It was stated that deliveries would be accepted on the co-operative plan of part cash payment and later distribution of bonus, for cash in full direct; or the corn would be accepted merely for kiln-drying. By the first plan a preliminary payment of 2*s.* 6*d.* per bushel of shelled corn was offered, to be followed by distribution of the net profits less 25 per cent. This latter plan, with certain differences in prices, is also followed at the Government Granary in St. Vincent, where a corn drier and storage accommodation have been installed. In the St. Vincent *Government Gazette* for September 30, 1916, the rules are stated thus:—

1. Only good yellow corn will be purchased.

2. Corn will be bought on a profit-sharing basis as follows:—

(*a*) Lots in lesser quantities than 25 lb. of corn on the cob or 20 lb. of shelled corn will not be bought, except from those persons who have previously sold corn during the then current season.

(*b*) Corn will be paid for at the rate of 3*s.* 4*d.* for every 100 lb. of first grade corn on the cob or $\frac{1}{2}d.$ per lb. for shelled corn. This price is subject to market fluctuations.

(*c*) Any profits after paying all expenses will be divided by way of bonus, 75 per cent. to sellers and 25 per cent. to the Ginnery.

(*d*) All corn brought for sale on the profit-sharing system must be clean, sound, and well sun-dried. Corn on the cob must have the husk removed. Second grade corn will not be accepted under any conditions.

3. (*a*) Corn will also be received at the Ginnery for shelling and drying at a charge of $4\frac{1}{2}d.$ for every bushel of 56 lb. returned to the sender, and

(*b*) Shelled corn received for drying only will be charged for at the rate of 4*d.* per bushel of 56 lb.

(*c*) Senders must provide their own bags.

(*d*) A notice of intention to send corn for shelling and drying, or for drying only, must be given not less than two weeks in advance, and corn will only be accepted by arrangement with the Manager within the capacity of the machinery. Any kiln-dried corn left at the Ginnery for more than one week will be charged for thereafter at the rate of 1*d.* per cwt. per week.

(*e*) Kiln-dried corn will not be stored for more than a fortnight.

4. Shelled corn will be ground into meal at the rate of $\frac{3}{4}d.$ per gallon.

In connexion with the price of drying the corn, St. Vincent charges $4\frac{1}{2}d.$ against 6*d.* in Antigua, but the Antigua charge varies according to the market price of corn. In general the rules for both granaries are much the same, and presumably the charges vary with market prices in both cases.

It is hoped that planters, both large and small, will continue to make increasing use of these granaries. It is highly desirably to produce as much locally grown corn as possible. There is a strong tendency to neglect corn on account of, for the time being, the higher cash value of sugar-cane.

WORKING OF THE ANDERSON OIL EXPELLER IN ST. VINCENT.

The Agricultural Superintendent, St. Vincent, (Mr. W. N. Sands), has forwarded figures showing the result of the working of the Anderson Oil Expeller at the Government Cotton Ginnery, St. Vincent, for the 1915-16 crop. The amount of cotton seed crushed was 320,714 lb. or 143·18 tons. This comprised both Sea Island and Marie Galante seed, some lots of which yielded poorly, while others yielded well. It is stated that a ton of good Marie Galante seed yielded over 40 gallons of crude oil, whereas some Sea Island gave far lower returns. In a general way, it would appear that the percentage of meal obtained was up to expectations, but the oil appears rather below the average. In connexion with the inferior oil and foots (3) only 540 lb. was unsaleable. A local soap maker bought this oil. The linters (4) are below the average, and this is of interest. The working loss (5) was 6·51 per cent. This would indicate seed with a high percentage of moisture.

The figures actually obtained and those arrived at by calculation based upon average yields in the United States (see Cotton Seed Products by Lamborn, p. 36) are as follows:—

				U.S.A. (Per cent.)
(1)	Meal with hulls	254,066 lb.	= 79·22 per cent.	82·80
(2)	Crude oil—good	43,256 ,,	= 13·49	= 13·98 14·10
(3)	,, inferior and foots	1,565	= ·49	per cent.
(4)	Linters	927	= ·29	,, 1·15
(5)	Loss in working	20,900	= 6·51	,, 1·95
			100·00	100·00
(6)	Meal per ton of seed	1,774		
(7)	Crude oil—good per ton	302·12 lb.		

A number of experimental trials have been made during the season to reduce if possible the dark colour of the crude oil, and those indicated that the heat of the tempering apparatus should not exceed 130°F. The temperature eventually applied to crushed seed before it entered the expeller was 120° F. The result of reducing the temperature of the tempering apparatus is not stated, but information on this point has been asked for.

Mangrove Wood.—Several attempts have been made recently to induce railway companies to use the wood of the mangrove (*Rhizophora Mangle*, L.) for sleepers, but as the mangrove is usually a small tree, it is likely that greater success would attend the introduction of the wood if it could be utilized for some purpose where timber of smaller dimensions is in demand. Mangrove wood might be used successfully for pit props and other mine timber since the wood is both strong and durable; it is, however, heavy, a disadvantage where freight is concerned. As the sleepers in question were shipped from West Africa, it might be possible to import a cargo of the smaller-size wood cut to suitable lengths for trial for pit props. The weight of the wood appears to range between 48lb. and 65lb. a cubic foot. (*Kew Bulletin of Miscellaneous Information.*)

PLANT DISEASES.

ROSELLINIA ROOT DISEASES IN THE LESSER ANTILLES.

The following is a summary of an important paper by Mr. W. Nowell, D.I.C., Mycologist to this Department, on Rosellinia root diseases, which appears in the current number of the *West Indian Bulletin* (Vol. XVI, No. 1):—

Several species of the genus Rosellinia give rise to a well-defined type of root disease in numerous countries of the world, temperate and tropical. The fungus kills out cultivated trees or shrubs in patches, and often infests the soil and destroys practically all vegetation with which it comes into contact.

In the Lesser Antilles, Rosellinia diseases occur in Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, and Grenada; they are unknown in the remaining islands of the group, which have drier climates.

The range of hosts is an exceedingly wide one, embracing practically all the important cultivated and semi-cultivated plants, but the cultivations most affected are those of cacao (in all the islands), coffee (in Guadeloupe and Martinique), limes (on new clearings in Dominica), and arrowroot (in the interior districts of St. Vincent).

The disease on cacao is usually caused by the species *Rosellinia Pepo*, and in most cases at the present time, the fields being well established, is communicated from the roots of dead or dying shade trees, especially breadfruit, avocado pear, and pois-doux. Another species as yet unidentified, is believed to attack cacao in certain localities.

The disease on limes and coffee is caused by *R. Pepo* or *R. bunodes*, indifferently.

The first cases in new clearings are usually associated with forest stumps left to decay, especially those of certain special trees. Subsequent cases arise from the spread of the fungus from tree to tree along the roots, or by infection from surface soil rich in decaying vegetable matter, which readily becomes infested in damp and shaded situations.

An infested tree may be killed gradually by the progressive investment of the roots, or rather quickly by the destruction of the bark around the collar. The fungus penetrates both bark and wood. Conidia are produced with great readiness wherever the mycelium emerges into the open; perithecia occur later, and especially in the case of *R. Pepo* their formation may be long delayed.

Much can be done to prevent outbreaks of the disease by measures directed towards exposing to wind and sun the soil, the bases of the trees, and any logs or other dead material lying about. Cases which arise may be restricted by these measures and by the provision of a close system of trenches to prevent root contact.

Treatment by excision and exposure is successful in the early stages of infection, but in practice these are hardly ever detected. Periodical surveys would save many trees.

Infested trees should be flamed and then promptly removed, all roots dug out and burnt, the soil limed, and the situation exposed as much as possible. All adjacent trees should be isolated from each other by trenches.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Mr. A. J. Brooks's report for October states that the rainfall at the Botanic Gardens, Castries, was 21·82 inches. The maximun fall was 3·34 inches on the 21st, while rain fell on twenty-six days. The rainfall at the Agricultural and Botanic Station, Choiseul, was 11·35. Work in the Experiment Station has included the planting of lime seedlings for 1917, the budding of oranges, and the planting of provision crops. In the Botanic Gardens, work was retarded by the heavy rainfall. Observations relating to the staple crops show that at the time of writing there was a good cacao crop but this was late in some districts. The lime crop slackened during the month. Extension in lime planting continues. As regards sugar, it is stated that the canes are now arrowing and there is a good stand throughout the island. Thirteen casks of concentrated lime juice were prepared at the Government Factory during the month and 11 carboys of distilled oil await shipment. The new Crossley 5½ h.p. oil engine gave every satisfaction during its trial run. Further soil shrinkage tests have been made in connexion with cacao cultivation

A meeting of the Good Shepherd Catholic Friendly Society was held in Castries on October 22, attended by the Inspector of Agricultural Credit Societies. It was decided to form an agricultural credit society, limited to members of the former society, and to advance money for agricultural purposes to its members from its surplus funds. The agricultural officers in St. Lucia devoted special attention during October to peasant cultivations, urging the planting of ground provisions.

ST. KITTS. In Mr. Shepherd's report for October it is stated that work in the Experiment Station largely consisted in planting provision crops and in picking cotton from selected plants and from the manurial plots. During the month 12,000 sweet potato cuttings were distributed. The Garden suffered severely from the strong southerly gale of October 9 and 10. On the estates the more advanced sugar-canes suffered worst, B.147 being the variety damaged most. This variety seems very susceptible to damage owing to its vigorous growth. In some instances the damaged canes have been used for planting purposes. Generally speaking, however, the heavy rainfall for the month (15·59 inches in the Valley district and 19·0 inches in the Northern District) has done much good, and the present condition of the cane crop is all that can be desired. It appears that cotton suffered much more than the cane, particularly along the coast. Appended to Mr. Shepherd's observations is a summary of the work conducted during October at the Government Chemical Laboratory. This included the examination of eighty-one samples of cotton lint, the partial analysis of three samples of soil, and the analysis of seventeen samples of milk from the Inspector of Police. On sixty-one of the cotton samples, lint length, available fibre, and ginning out-turn were determined, on the other twenty samples, lint length and ginning out-turn only, were ascertained.

THE BREEDING AND FEEDING OF PIGS.

In the issue of this Journal for August 12, 1916, an abstract appeared of an article published in the *Rhodesia Agricultural Journal* for April 1916, containing instructions as to the best methods of breeding and feeding pigs intended for sale at a bacon factory. In that part of the article dealing with the feeding of the animals, rations were given in which succulent food was substituted for skimmed milk. Several of these rations were composed of sweet potatoes, maize and pumpkins, and were regarded as of considerable interest in connexion with the feeding of pigs in the tropics. Undoubtedly the substitution of vegetable products for skimmed milk is an important matter in regard to the feeding of pigs in the West Indies.

In a subsequent issue of the *Rhodesia Agricultural Journal* (August 1916), an editorial note appears in which it is stated that the article in the April issue of that journal referred to above, has been severely criticised. The remark is made in this letter that any farmer who has not a sufficiency of skimmed milk to give his pigs had 'better get rid of them and leave pigs alone.' The *Rhodesia Agricultural Journal* maintains that satisfactory substitutes for milk in pig rations are known, and, better still, they are actually being used in Rhodesia with excellent results. Another statement is made in the letter that it does not pay to feed pigs on marketable produce. This statement is not borne out by the experience of any other pig-raising country of the world, nor, as the Journal points out, by the experience of Rhodesian breeders either. It would appear that the criticisms on the article are unfounded, and that reliance may be placed upon such tropical provision crops as sweet potatoes, ground nuts, maize, rice, and succulent food for the successful feeding of pigs, while the employment of skimmed milk is not necessary.

Crop Experiments in Rhodesia.—The *Rhodesia Agricultural Journal* for August 1916 contains the results of crop experiments at the Government Farm in that country. Some of these are of interest in the West Indies. Distance planting experiments with ground nuts, velvet beans and cowpeas have been carried out. Ground nuts drilled 36 inches apart yielded the best (520 lb. per acre). Velvet beans also yielded best at the same distance, giving 1,900 lb. of hay and 372 lb. of seed per acre. In connexion with the harvesting of velvet beans, the irritation caused by the black hairs on the stalks and pods was obviated by cutting the crop about 6 or 8 inches above the ground, leaving the bunch of pods round the base (the main crop) when these were well formed, but the remainder on the runners were just set or still only flowers. The vines or tops were gathered in small heaps to dry, and later on carted away. Interesting experiments have also been conducted with Guinea grass (*Panicum maximum*), and also with Soudan grass (*Andropogon* sp.). Both of these grasses have given signs of great promise in Rhodesia. Soudan grass appears to be very resistant to climatic changes.

A copy of a Proclamation prohibiting the importation into the Presidency of Antigua of cane plants and parts of the sugar-cane from the Colony of Trinidad has been forwarded to this Office by the acting Governor. This legislative action has been taken with the object of preventing the introduction into Antigua of the sugar-cane froghopper (*Tomaspis* sp.).

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets, for the month of September:—

The month of September opened with very little interest either for spices or drugs, and with very slight variations in bulk or prices from those reported upon for August. Though August and September are the normal holiday times in years of peace, the war has to a certain extent modified these customs, though they have, perhaps not been so strictly observed this year as they have been in the previous years of the war. Spices have in particular been slow of demand. The following are the principal details.

GINGER.

At the first spice auction on September 6, ginger was in fair demand at from 44*s.* to 46*s.* for washed Cochin, and 40*s.* to 42*s.* for wormy; no Jamaica was offered at this auction but a week later, 16 bags of common small Jamaica were offered and disposed of at 82*s.*; some 570 odd bags of washed Cochin were offered and bought in at 47*s.*, and 168 bags of limed Japanese were also offered and bought in at 40*s.* Pimento has been in slow demand throughout the month at 3⅛*d.* per lb.

SARSAPARILLA.

At auction on the 21st, sarsaparilla was represented by 35 bales of grey Jamaica, 13 of native Jamaica, 20 of Mexican, and 8 of Lima. Of the first, 9 bales were disposed of at from 1*s.* 9*d.* to 1*s.* 10*d.* per lb. for fair quality, and 1*s.* 7*d.* for rough and damaged. The whole 8 bales of the Lima-Jamaica were disposed of at 1*s.* 6*d.* per lb., but none of the native Jamaica nor the Mexican found buyers.

ARROWROOT, LIME JUICE, LIME OIL, CITRIC ACID, ANNATTO, AND KOLA.

At the beginning of the month ordinary manufacturing St. Vincent arrowroot was quoted at 2¾*d.* to 3*d.* per lb., and fine manufacturing at 3¼*d.* Lime juice at the beginning of the month was offered at 2*s.* 9*d.* per gallon for fair raw West Indian, but a week later it rose to 3*s.* 3*d.* to 3*s.* 6*d.*, in consequence of a large Government order having been received, together with the effects of the hurricane in Dominica. It was further announced, however, that some 400 or more packages, principally from Dominica, had recently arrived. There has been a quiet demand for lime oil during the month, fair West Indian distilled being quoted at 8*s.* per lb. in the early part of the month, but later on this article was also affected by the Dominica calamity. In the early part of the month citric acid was again declining, being obtainable at 2*s.* 10*d.* per lb., and at the close of the month it had dropped to 2*s.* 8*d.* Annatto seed was in good supply at the auction on the 21st when 60 packages were offered, only 15 of which were disposed of, fetching 9*d.* per lb. for fair Madras, the remainder (fair Jamaica) being held at 1*s.* per lb. At the same auction, Kola was represented by 378 packages, only 63, however, finding purchasers, bold Java halves fetching 6*d.* per lb., and bright Ceylon halves 6*d.* to 6½*d.*

MARKET REPORTS.

London.—The West India Committee Circular, October 5, 1916.

Arrowroot—2½*d.* to 4¾*d.*
Balata—Sheet, 3/3 to 3/6; block, 2/3½.
Beeswax—No quotations.
Cacao—Trinidad, 84/- to 85/-; Grenada, 72/6 to 73/-; Jamaica, no quotations.
Coffee—Jamaica, 65/-.
Copra—£32.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—Bananas, £17 per ton; Oranges, Jamaica, 16/- to 18/- per case.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—Jamaica, 35/- to 45/-.
Lime Juice—Raw, no quotations; concentrated, £22; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6*d.* to 2*s.* 2*d.*
Nutmegs—5¾*d.* to 1*s.* 2*d.*
Pimento—3⅛*d.* to 3½*d.*
Rubber—Para, fine hard, 3*s.* 2½*d.*; fine soft, 2/11; Castilloa, no quotations.
Rum—Jamaica, 3/11 to 5/7.

New York.—Messrs. Gillespie Bros. & Co., October 20, 1916.

Cacao—Caracas, 14¼c. to 14¾c.; Grenada, 15c. to 15¼c.; Trinidad, 15c. to 15¼c.; Jamaica, 11¼c. to 12¼c.
Coco-nuts—Jamaica and Trinidad selects, $42·00 to $43·00; culls, $20·00 to $22·00.
Coffee—Jamaica, 9½c. to 11½c. per lb.
Ginger—14½c. to 17½c. per lb.
Goat Skins—Jamaica, 65c.; Antigua and Barbados, 60c. to 63c.; St. Thomas and St. Kitts, 45c. to 62c. per lb.
Grape Fruit—Jamaica, $2·00 to $2·50.
Limes—$4·50 to $5·00.
Mace—45c. to 51c. per lb.
Nutmegs—16c. to 17c.
Oranges—Jamaica, $1·75 to $2·25.
Pimento—5c. to 5¼c. per lb.
Sugar—Centrifugals, 96°, 6·27c; Muscovados, 89°, 5·51c.; Molasses, 89°, 5·39c. all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 19 1916.

Cacao—Venezuelan, $15·00 to $15·50; Trinidad, $15·00 to $15·50.
Coco-nut Oil—$1·08 per Imperial gallon.
Coffee—Venezuelan, 15c. to 16c.
Copra—$5·75 per 100 lb.
Dhal—No quotations.
Onions—$4·50 to $5·00 per 100 lb.
Peas, Split—$11·50 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $7·50 to $8·00; White, $7·40 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., November 1, 1916; T. S. Garraway & Co., October 30, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·50 to $15·50 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$4·75 to $5·00.
Peas, Split—$9·50 to $9·65 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·25 to $4·75.
Rice—Ballam, $6·30; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·25.

British Guiana.—Messrs. Wieting & Richter, October 31, 1916; Messrs. Sandbach, Parker & Co. October 20, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	$12·00
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	14c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	17c. to 18c.
Liberian	11c.	13c.
Dhal—	$6·50 to $7·25	$6·50 to $7·25
Green Dhal	——	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	2c.	——
Madeira	4c.	4c. to 4½c.
Peas—Split	$12·00 to $12·50	$12·00
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·75 to $6·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·16	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50 to $6·00
Tannias—	$2·88	——
Yams—White	$2·88	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $5·10	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	$7·00	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Constructive Soil Ventilation.

WHEN considering the composition and structure of a fertile soil we are very apt to overlook the fact that air is a constituent part just as essential as water or plant nutrients. Air *supply* has never taken definite shape in soil science to the extent water-supply or plant-food supply has, and consequently, an important field of investigation appears to lie practically untouched. It is true that drainage in relation to soil ventilation is appreciated as well as methods of cultivation that go to produce a good tilth, but that does not teach us anything: it gives us no definite clue as to what the roots of different crops require, or whether air supply might not be more scientifically adjusted to suit the roots of different crops and the beneficial bacteria that function under similar conditions in the soil. If under certain circumstances it were found to be desirable, it should be quite practicable to supply the soil with air by more direct means than by cultivation or drainage, just as we know it is practicable to supply the soil with plant food in the form of chemicals instead of relying upon weathering and the decay of organic matter. These considerations suggest a new aspect of land culture, namely, Constructive Soil Ventilation—a definite branch of agricultural engineering associated with Drainage.

Before proceeding to enlarge upon this idea, it will be well to consider what evidence exists to justify it.

The importance or soil ventilation has been brought out prominently by the observations of Howard in India. He has pointed out that crops undoubtedly differ greatly in the amount of air their roots require. In India, for example, Gram requires a great deal of air, and only a moderate amount of water. In some parts of the country the conditions both natural and artificial are such that the roots get plenty of air. Here this particular crop thrives. But in other places where, for instance, irrigation conditions obtain, Gram will not grow successfully. Howard maintains that the proper provision of air to the soil is all that is necessary for extending the cultivation of this useful crop. The facts are the same in regard

See Bulletins Nos. 52 and 61, Agricultural Research Institute, Pusa; also *Agricultural News*, Vol. XIV, No. 352, p. 337.

to the cultivation of Indigo. This crop is largely cultivated on the higher levels in rice-growing districts. The occasional flooding of these higher levels due to the rise of the rivers is the cause of the low yields obtained in India compared with those obtained under drier conditions in Java.

The two crops just referred to are of course leguminous, and the detrimental effect of insufficient air is partly due to the limited supply of nitrogen available for fixation by the nodules on the roots. But that is only partly the reason; bad aeration has a general retarding influence upon root development. Howard has noticed this even in the case of wheat, which is a crop that can be successfully grown on very heavy land. Experiments conducted at Pusa show that the best-grown wheat can be raised only on soil that is well aerated. Lastly, rice which grows in swamps is unable to thrive without a supply of oxygen for root development. This is obtained through the surface film of algae and other green organisms on these soils. Certain cultural operations after harvest also help to conserve a store of oxygen in the soil subsequent to the arrival of the rains.

Other crops in other parts of the world are equally susceptible to anaerobic conditions in the soil. In regard to cotton, we know that this plant thrives best on soils of open texture, and that the principal cause of boll shedding is root asphyxiation, proved by Balls in Egypt and fully supported by observations in the West Indies. Cacao is extremely sensitive to clay. That may be because cacao is naturally a deep-rooting plant and the clay offers mechanical resistance to the extension of the roots: but it is also likely to be due to the fact that a clay soil contains less air than a light soil. It is not merely a clay subsoil but a clayey surface soil that has an adverse effect on the growth of cacao.

Coco-nut trees are very sensitive to inadequate aeration. They will thrive only on land that is well drained either naturally or artificially. No harmful effect is produced on the roots by the presence of water; coco-nuts will thrive in saturated soil provided the water is continually moving. This is a very significant fact concerning the physiological importance of soil aeration.

In view of all these facts, which come within the range of observation of the planter himself, it will be admitted that soil aeration demands greater attention than it has received. The significant fact is, that air is the limiting factor to the efficiency of water-supply. Beyond a certain point, water is wasted in the soil it is not aerated.

Turning more particularly to the physiology roots, it is very desirable to know more concernin their respiration. Respiration has been studied almo exclusively in regard to the parts of the plant abo ground, and the generalizations have been extended apply to the roots. But it does not seem justifiable assume that the manner in which roots breathe und the complex conditions, both chemical and physica of soil environment is the same, and follows the sam laws as those parts of the plants exposed to the com paratively simple environment of the atmospher There is probably a difference in the rate of respiratio of the roots of certain plants, and as already suggested i this article, the growth of certain crops might be stimu lated by the artifical introduction of air into the soi

Constructive Soil Ventilation as an establishe branch of agricultural engineering presupposes succes full researches into the air requirements of roots an soil organisms. The desirable conditions in differen cases having been determined, it should then b possible to establish them.

The methods of effecting soil aeration artificiall would come within the province of the enginee Possibly one method would be to lay down porou ventilation pipes through which air could be introduce if necessary, under pressure. In orchard cultivatio vertical tubes might be introduced near the trees an air pumped down them periodically. In the light o soil aeration better use might be made of soil explosion with dynamite, to aerate clayey subsoils especially.

Investigation might show that an alteration in th percentage composition of the soil atmosphere woul prove advantageous in some circumstances: fo example, a high proportion of oxygen might prov beneficial, or in some cases the removal of an excess o carbon dioxide. There is also the question of the possibl value of introducing gases other than those that norm ally constitute the air of the soil. A matter for specula tion is whether liquid air could be usefully employed a a soil fertilizer.

Finally, more might be done to bring about a better state of aeration in certain circumstances by means o methods of cultivation. The forking of orchard soils is still a matter of some controversy, and the true value o this operation requires investigation. The ploughing o the soil in coco-nut plantations gives good results, but its relation to soil aeration is not generally recognized

The full appreciation of the importance of soil aeration would no doubt lead to the invention of special implements, designed with the special object of introducing air into the soil.

THE WEATHER.

HEAVY RAINFALL IN THE WEST INDIES.

From all quarters reports arrive regarding the heavy rains experienced during the end of October and the first half of November. From St. Vincent, Mr. Sands states that the phenomenal rainfall of the twenty-three days, October 21 to November 12, has been the cause of a great deal of damage to lands and crops throughout St. Vincent and the Grenadines. The prolonged and heavy rains were probably unequalled in magnitude in the history of the Colony. The total rainfall measured at the Botanic Gardens was 36·17 inches. Of this 10·57 inches were recorded for the last seven days of October, and 25·60 inches for the first twelve days of November. It is stated that the rainfall in other parts of the island was almost as heavy as this, judging by the nature of the reports of loss and damage which had been received.

The effect has been to cause soil washing, landslides and damage to roads. It is feared that the cotton crop has suffered to a grave extent, the loss of crop being put down at something like 50 per cent. The arrowroot crop has also suffered, while ground nuts, as might be expected, have suffered seriously. Sugar-cane seems to have been affected least of all.

From Montserrat Mr. Robson writes: 'I have to report that very excessive rains have been experienced in Montserrat for the month of October, ending last night (October 29) in a fall of 7·59 inches chiefly between the hours of 10 p.m. and 2 a.m. The total rainfall at Grove Station for the month to date is 18·87 inches. The excessive rainfall has put a somewhat different complexion on the outlook for the cotton crop, and although it promises to be a fair one, picking has been very seriously hampered by the wet weather.'

In the Virgin Islands as well as in St. Lucia have somewhat similar conditions prevailed: The wet weather in the latter island has been responsible for a good deal of black rod amongst cacao. As mentioned in the article in this issue on crop conditions in Barbados, the estates in that island have been handicapped as regards preparation of the land by the heavy falls of rain. The wet weather has also been responsible for landslides of a serious nature.

HURRICANE DAMAGE IN DOMINICA.

The Curator of the Botanic Gardens, Dominica, has submitted for the information of this Office, a copy of a report by the Assistant Curator (Mr. G. A. Jones) on his visit to different parts of the island, having for its object the ascertaining of the damage sustained by estates and the peasantry during the hurricane of August 28 last. It would appear from the Report that the southern end of the island, which is the great lime-producing portion, escaped with but slight damage. The chief loss was from the heavy falling of fruit, and the insufficiency of labour and facilities to deal with such an emergency, thus resulting in the rotting of many barrels of limes. The loss from this cause is also general throughout the island. The estates in the interior of the island have suffered considerably, but their powers of recovery under these conditions are so great that inside of five years conditions should be once more normal. According to the report, only three estates can be said to have suffered very severely, and even then the losses of two are covered by insurance, while the third has a considerable acreage of young limes soon coming into bearing. Thus, on the whole, the damage occasioned by the storm, while quite serious, would appear to be rather of a temporary than of a permanent character.

CROP CONDITIONS IN BARBADOS.

In continuation of the statement regarding weather and crop conditions existing in Barbados, referred to in the last issue of this Journal, the *Agricultural Reporter* for November 18 mentions that the weather during the preceding fortnight, so far, has been the wettest for the year; in no part of the island was the rainfall less than 7 inches. As a result of this abnormal precipitation, practically every form of work was brought to a standstill, except the procuring of fodder for the live-stock and the carting of litter to keep the stock pens in habitable condition. Weather like this has not been recorded for twenty years past, when the rainfall for the month of November 1896, reached 33 inches. In St. Andrew and St. Joseph parishes, landsides have occurred; about 6 acres of land in St. Andrew slid away, carrying with it one of the bridges on the main road of that parish. These conditions, along with a shortage of labour referred to in the previous report, have been a source of much anxiety, and it will require several weeks of fair weather to enable the planters to make headway.

There has been a welcome change in the weather however, since the 13th instant, and no time has been lost in taking in hand every necessary form of work. Farm-yard manure which had been buried in the cane holes is being turned out to make room for the cane plant, and planting has commenced in several districts. Most of the estates are cutting their own plants either from fields of plant canes or from ratoons.

In addition to the work incident to this time of year, several estates are improving their roads by widening them, or by making extensive repairs. This has been found necessary to facilitate the carting of canes to the factories.

The cane crop for 1917, it is stated, has had ideal weather; it only needs light rains now to keep it in a healthy condition until it has quite matured. A fortnight of dry weather, it is thought, would do all crops good and enable them to develop under the most favourable conditions.

The appearance of the Lisbon yam crop is all that could be desired. Horn and Oriental yams are being sold at $2·40 per 100 lb. and there is said to be a fair supply in the market. Nut eddoes are being sold at 4c. per lb. Potatoes continue to be retailed at one cent per lb., but the quality is said to have deteriorated, not in consequence of the abnormal rainfall, but that they are being reaped before they have reached maturity.

The shipment of sugar during the fortnight ended November 9 was regarded as a large one for the time of year, the exports being 2,290 tons of sugar and 1,096 puncheons molasses. This brings the total shipment of the year's crop up to 51,816 tons sugar and 89,062 puncheons molasses, as compared with 27,634 tons sugar and 53,874 puncheons of molasses at the corresponding period of last year.

SUGAR.

THE STUDY OF THE SUGAR-CANE IN INDIA.

There has recently been issued by the Imperial Department of Agriculture in India an account by Dr. C. A. Barber, Government Sugar-cane Expert, Madras, of his studies on Indian sugar-canes at the Cane-breeding Station at Coimbatore. This deals with observations on the methods of raising, and characteristics of sugar-cane seedlings, and discusses some correlations existing between morphological characters and sucrose in the juice. While in the West Indies this publication in respect of its details will interest principally experiment station workers with sugar-cane, there are nevertheless many matters which will prove interesting to the general reader.

The first piece of successful work accomplished at this newly-founded cane-breeding station in India was the production in that country of seedling canes. This appears to have been repeatedly attempted, and the reason for previous lack of success seems to be that almost all the efforts were made in North India. Flowering of the sugar-cane is rare there, and, when it occurs, there is generally sterility in the male organs. The flowering of the sugar-cane decreases steadily in India as we proceed north and west, until it disappears entirely.

Flowering at Coimbatore occurs from October to December. A study of the best method to induce flowering has resulted in the discovery that it depends chiefly on the time of planting. The best planting time for obtaining arrows is generally about November. As this is not the best time for general cane planting on the station, 'arrowing plots' have been instituted, planted in November, and these have been attended with marked success. As in the West Indies, certain years appear to be better for arrowing than others.

For protection against foreign pollen, the arrows are covered by fine muslin bags outside bamboo or iron cages, such as is done in Java work. Cageing must be done before emergence of the inflorescence from its sheath, as some flowers have been seen to open their anthers before protrusion. It seems as if there is some ground for assuming prepotency of the pollen in cane flowers, although this has not been definitely settled.

The sources from which cane arrows have been obtained are various. An increasing number of canes have lately been induced to flower on the station itself, and the farm is thus becoming independent. The pollen is now being sent from a distance by post, by the use of small gelatine capsules, and appears to retain its vitality longer than expected. Sugar-cane seed has also been tested and has proved to keep good for a number of months.

The collected arrows are chopped up and spread over an intimate mixture of finely powdered horse manure and river sand placed in shallow pans. After watering and keeping the pans in the full sun the seedlings begin to appear on the fourth day, but in some instances have been known to germinate only after a full month. At six months they are planted in pits for study. At first these pits were large and there was some suspicion that the generous nature of the environment reduced the sugar content of the plant, so the pits have now been made smaller.

It is interesting to record that the land on the farm is slightly saline in character, and green dressings, especially *Dolichos lablab*, have been found a useful treatment for improving the soil

In India it takes eighteen months for the seedlings to mature, and it takes three years before a seedling is ultimately distributed for planting purposes. But it is generally wise to refrain from sending out cuttings until tests have been made for two or three years longer.

The vitality of the seedlings of different parentage have been found to vary a good deal. In some cases such as 'Java' the fertility of the arrows appears to be very great, but the seedlings are so delicate that they die in thousands when very young. The seedlings obtained by crossing cultivated canes with wild grasses are characterized by excessive vigour.

An enumeration of the various seedlings obtained each year is given in the paper. There has been a good deal of variation in the parentage each year, owing to the particular canes flowering. The idea constantly aimed at is to obtain crosses between the various North Indian canes and thicker better, tropical ones, with the object of producing varieties capable of being grown in North India under ryots' conditions. Success so for has not been great on account of the dependence on simultaneous flowering of the desired parent. The current flowering season (1915), however, promises very well, as a large number of indigenous canes and introduced tropical ones are flowering together on the farm. Most of the former have infertile stamens, which is considered a further augury of ultimate success.

The sucrose content of the seedlings raised at the Indian sugar-cane breeding farm has steadily increased during the past three years. During the current harvesting season the sucrose in many seedlings has been very high, and about 250, which have produced over 18 per cent. of sucrose in the juice, have been selected for growing on. It is of interest to record the fact that the highest figure was in a seedling raised from B.208, which recorded 23·4 per cent. sucrose in the juice.

The variations in the morphological characters of the seedlings have been carefully noted, with the object of correlating them with richness of juice. General habit appears to be of the greatest use in classification of seedlings, as it has proved to be with varieties of cultivated cane. In connexion with correlations dealing with seedlings of common parentage it is important that such correlations should be detected early in the life of the seedlings, so as to avoid rearing useless plants; but there are special difficulties in the way, and the principle has been adopted of trying first to find such correlations in mature canes at crop time, and later, to attempt to correlate infant and mature characters. The first step alone has been tried at present, and the following correlations have been studied between mature characters and sucrose in the juice, the results being given in the summary table appended in the paper: correlation between the amount of sucrose in the juice and various leaf and cane measurements (width, length and module, or length divided by width) and colour of cane, and correlations between leaf width and thickness of cane, tillering power and total weight of seedling. In the studies of the colour of cane, the interesting fact has come to light that, in coloured and striped canes used as parents, approximately half of the seedlings are green. This appears to be true of the coloured parents in 1912-14, although there may be a larger proportion where the parent itself is green.

THE SUGAR CROP IN PORTO RICO AND SANTO DOMINGO.

The *Louisiana Planter* (October 7) publishes the following interesting information regarding the extension of sugar production in Porto Rico and Santo Domingo:—

The press telegrams have given complete statistics of the sugar production in the island of Porto Rico for the season just closed. The data have been compiled by the Insular Treasury Department, which shows that the island's sugar output was 483,590 short tons. As the sugar statistics of the world generally are now kept in the long English ton of 2,240 lb., or the metrical ton of 2,220 lb., the data given by the Insular Treasury Department are a little ambiguous. Regarded in this way the crop would amount to 431,777 long tons, as against 308,178 long tons last year and 325,000 long tons the year before. The extraordinary increase of over 123,000 tons makes an increase of about 40 per cent. in a single year, and would be record breaking for almost any sugar country on earth. The value of the Porto Rico sugar crop to the producers is said to be about 53 millions of dollars. We note, however, that the quotation given is 5½c., and presume that from that the cost of transportation to the mainland is chargeable, and that the net price received would be but little, if any, over 5c.

THE SUGAR CROP IN SANTO DOMINGO.

We have recently received from the American Consul-General in Santo Domingo some interesting data concerning the production of sugar there. The sugar in Santo Domingo is packed in bags, the average weight of which is stated to be about 310 lb., and to make the calculations comparable with the rest of the sugar world, 7 bags can be estimated for a ton, and we find that the present expected grand total of the three leading districts amounts to 1,033,000 bags, or say, 148,000 long tons, for the probable crop of 1916-17, which of course is now only an estimate. The actual crop of the year 1915-16 closing, was 877,769 bags or 125,400 long tons. The crop of the previous year was 752,287 bags, or say, 107,469 long tons.

These figures show a constant increase which is very suggestive as to the immediate future. Santo Domingo lies between Cuba and Porto Rico, and there is no particular reason why Santo Domingo should not increase in its production almost as rapidly as Porto Rico; and the crop of Porto Rico now exceeds 400,000 tons.

Our advices from Santo Domingo are to the effect that all the plantations except one have increased in their output. The high prices obtained in the United States helped to make this season one of the best experienced in recent years. The disturbed political conditions during the last few weeks of the grinding season were about the only unsatisfactory feature of the season.

One new estate, San Jose, will be producing this coming season. Another estate, San Luis, estimates its next output at about twice the size of the season now closing. This increase is attributed to an enlarged area under cultivation. Various other plantations are expecting increases in their output of from 30 to 40 per cent.

Sugar-cane has been exported from La Romana plantation to Porto Rico, and the entire output during the season of 1915-16 amounted to about 140,000 tons. The estimate of the new crop is about 180,000 tons. It is not stated whether these are long tons or short tons, or the sometimes so-called ton of the Cubans of 100 arrobas of 25 lb. each.

THE COLOURING MATTER OF CANE JUICES.

An article appears in the *Louisiana Planter* for October 7, 1916, written by the Research Chemist, Louisiana Experiment Stations, on the subject of the colouring matter of cane juices. The following are the main conclusions. These will interest readers concerned with the production of white sugars:—

1 The eyes and tops of sugar-cane contain polyphenols which pass into the juice.

2 Traces of iron are sufficient for the production of a very dark colour in such juices.

3 Reducing agents, such as SO_2 and hydrosulphites are only temporary remedies. The dark colour returns on oxidation or cooling of juices and syrups.

4 The dark shade of plantation white sugars, increasing in storage, is due to traces of phenol iron compound.

5 A permanently light-coloured juice may be obtained by:—

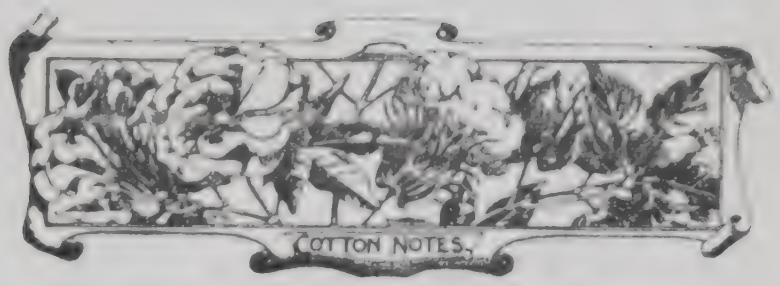
(a) Complete elimination of all traces of iron and complete avoidance of contact of liquors with iron during further stages of manufacture.

(b) Elimination of polyphenols by boneblack, vegetable charcoal, etc.

6 The polyphenol content of juices could be reduced by topping cane low, using tops for planting. This would result in a distinct improvement of the colour of juices.

Soy beans have been found to give the ferric chloride colour test for salicylic acid and the negative test for salicylic acid with the Jorissen reagent and with the Millon reagent in the cases tried. The compound, therefore, is not salicylic acid but some substance which merely answers a test for that compound. The substance is undoubtedly similar, according to the *Philippine Journal of Science* (Vol. XI, Sec. A, No. 2) to the maltol of Brand, and is probably formed by enzymic action in the beans. The economic importance of this conclusion will be evident. The law prohibits the addition of a preservative like salicylic acid to food mixtures, and without the work recorded in the paper under review, a conclusion based on the ferric chloride colour test might be wrongly drawn that the preservative had been added to a soy bean mixture.

It is stated in the *Hawaiian Forester and Agriculturist* for August 1916, that the reports of the superintendents of the four divisions of the Board, for the fiscal year ended June 30 1916, which appear in that issue, tell of the continued good work being done to aid forestry and agriculture and allied industries in the territory. Special attention is called to the continuation of the work of forest protection by fencing forest boundaries and the appointment of additional forest rangers; the continued rigid inspection of imports of vegetable matter to prevent further injurious insects from reaching those shores, the breeding of beneficial parasites on pests established there, and the introduction of a new parasite on the lemon fly; the continued campaign to eradicate bovine tuberculosis, and the practical application of a cure for sorehead on chickens; and the progress made in obtaining measurements of Government water which will increase the amount of revenue coming to the territory from water in the future.



COTTON.

SEA ISLAND COTTON MARKET.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 28, 1916, is as follows:—

ISLANDS. Receipts for the week were 119 bales, and total to date 346 bales. The Census Ginners' report gave the ginning of Islands to the 18th as only 357 bales. Factors showed a willingness to open the market and dispose of their receipts of Fine to Fully Fine, which resulted in sales of upwards of 100 bales at 40c. Owing to the continued strength of the Savannah market, Factors are refusing to go on to make further sales at the price, preferring to await developments, and some further accumulation of stock. The above ginning figures and advices from the Islands confirm the estimates of the shortness of the crop, and it is now thought 3,500 bales is an extreme estimate.

Until the market has more fully opened we will omit quotations.

GEORGIAS AND FLORIDAS. The general and active demand has continued throughout the week, not only in Savannah where the offerings are small, but in all the interior markets. During the past few days several thousand bags have changed hands at some advance, the buying being on account of the Northern Mills, as well as on speculation. The advance in the Egyptian market, together with the excited and advancing Upland market, has caused all holders of cotton to be very firm and unwilling sellers except at still further advances.

As the United States Census Bureau reported 64,931 bales ginned to October 18, pointing to a crop of upwards of 100,000 bales being the largest ginning ever reported up to this time, nevertheless it apparently had no effect on the views of buyers and sellers, the general impression being that a large crop is required by the trade, and that high prices will continue to rule.

We quote, viz:—

GEORGIAS AND FLORIDAS.

Fancy	40c. to 41c. = 41½c. to 42½c.	landed
Extra Choice	39c. to 40c. = 40½c. to 41½c.	,,

The exports from Savannah for the week were 1,959 bales to Northern Mills, 114 bales to Southern Mills, and from Jacksonville to Northern Mills 1,996 bales.

The U.S. Census Bureau reports cotton ginned to October 18, as follows:—

South Carolina	357 bales	} making a total of 64,931 bales.	
Georgia	43,565 ,,		
Florida	21,009 ,,		
Against last year	40,257 ,,	total crop	85,278 bales
,, 1914	30,078 ,,	,, ,,	78,857 ,,
,, 1915	30,880 ,,	,, ,,	85,544 ,,
,, 1912	15,960 ,,	,, ,,	66,169 ,,

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the quantities and estimated values of Sea Island cotton exported from the West Indies for the quarter ended June 30, 1916, and for the quarter ended September 30, 1916, respectively:—

Colony.	June 30, 1916. Quantity.	Estimated value,	September 30, 1916 Quantity,	Estimated value,
	lb.	£.	lb.	£.
Barbados	47,168	3,302	15,165	1,137
St. Vincent	45,079	3,678	3,983	266
Antigua	27,000	2,081	7,250	619
Montserrat	1,499	75	nil	—
St. Kitts	nil		23,789	1,492
Nevis	nil		12,862	804
Anguilla	nil		33,120	2,070
Virgin Islands	4,704	274	4,430	258
	125,450*	9,410	100 599†	6,646

*Besides the above Sea Island cotton, there was exported from St. Vincent 30,188 lb., and from the Virgin Islands 4,095lb. Marie Galante cotton, of the estimated value of £818 and £137, respectively.

†Besides the above Sea Island cotton, there was exported from Grenada 347 352 lb., from St. Vincent 14,697 lb., and from the Virgin Islands 1,661 lb Marie Galante cotton, of the estimated value of £14 473, £398, and £55, respectively.

The following table gives the quantity and estimated value of Sea Island cotton exported from the West Indies for the year October 1,1915, to September 30, 1916.

Colony.	Quantity, lb.	Estimated value, £
Barbados	127,875	8,809
St. Vincent	237,387	16,499
Antigua	80,250	6,020
Montserrat*	259,561	19,909
St. Kitts	131,859	8,246
Nevis	99,173	6,198
Anguilla	49,620	3,101
Virgin Islands	22,563	1,315
	1,008,288	70,097

* Owing to the lack of shipping facilities 20,034lb. of cotton remain unshipped of the 1915-16 crop. If this were included, the total would be 279,595lb.

Besides the above Sea Island cotton, there was exported from Grenada 347,352lb., from St. Vincent 44,885lb., and from the Virgin Islands 5,756lb. Marie Galante cotton, of the estimated value of £14,473, £1,216 and £192, respectively.

CHANGES IN COTTON SEED DURING STORAGE.

In connexion with the extraction of cotton seed oil, which is an industry of importance in Barbados and St. Vincent, the following abstract of studies of the changes in stored cotton seed with reference to the loss of vitality, and the availability from the stand-points of the cotton-seed-oil mill and the live-stock feeder,

taken from the *Experiment Station Record* (Vol. 35, No. 5), will be read with interest:—

The fat in ground cotton seed was found to hydrolyze rapidly into fatty acids. This hydrolysis may amount to 85 per cent. of the fat in three weeks.

In cotton seed from seed-cotton gathered dry and stored for three weeks in a common farm cotton house and in a cotton-oil mill seed house in lots of 4,500 and 7,500 lb., respectively, no appreciable changes except a reduction in the moisture content occurred. Dry cotton seed stored in a common farmhouse in a 3,000-lb. lot in a pile 12 by 12 by 4 feet did not deteriorate during the period of oil-mill operation. A slight loss of moisture in the samples caused correspondingly small increases in the percentage of protein and fat. The free fatty acids in the fat and the total acidity of this seed did not increase to any significant extent. Cotton seed stored in an oil-mill seed house in a 5,000-lb. lot in a pile $12 \times 12 \times 6$ feet, dried out in storage and then heated. During heating the free fatty acids in the fat increased from 2·26 to 11·89 per cent., and the total acidity from 28 c.c. of normal alkali per kilogramme of seed to 91 c.c. A slight protein hydrolysis was observed.

The free fatty acids in the fat of samples of fresh cotton seed at the time of picking was less than 2 per cent. of the fat, and the total acidity of the seed was about 26 c.c. of normal alkali per kilogramme of seed. It is deemed probable that the increase in the free fatty acids and in acidity is due to heating and not to ageing of the seed. Cotton seed stored in lots of 1,000 lb. did not deteriorate in storage.

It is indicated that in extreme cases of heating the carbohydrates, fats and proteins of the stored seed are attacked, and analytical data submitted show that the hydrolysis of the fat may reach 70 per cent., and that of the protein 35 per cent. When cotton seed heats, the fats decompose the most readily, and it was observed that this may take place to a considerable extent before the other constituents begin to undergo change. The acidity of fresh cotton seed is regarded as due only partially to fatty acids from the fat, but it is pointed out that in heated seed the content of free fatty acids is as great as, or greater than, is necessary to account for the total acidity. It is concluded that unless cotton seed heats badly, the meal made from it will be as valuable for feeding as meal made from unheated seed, but that the oil from even slightly heated cotton seed is worth considerably less than oil from fresh seed.

A SILK CAMP.

The *Pioneer Mail* has received the following from the Salvation Army headquarters at Simla :—

Perhaps the only mulberry forest in the world is to be found at Changa Manga, near Lahore. It is some 10,000 acres in extent, and has hitherto only been used for purposes of fuel and timber. It demonstrates that mulberry can be profitably grown by Government and private individuals for fuel and timber purposes, apart altogether from its great value in providing food for silkworms.

Some months ago Commissioner Booth Tucker asked the permission of the Punjab Government to take advantage of the immense supply of foliage in this forest to establish an annual silk camp during the months of February and March for the rearing of silkworms on a large scale, with a view of popularizing the industry throughout the Punjab and other parts of India, and in order to demonstrate the best methods for rearing silkworms. The Lieutenant-Governor expressed his cordial approval of the scheme, and 5 acres have been assigned within the forest for the purpose of the silk camp.

Operations were commenced early in January, when a party was sent in advance to make the preliminary arrangements for erecting sheds and preparing accommodation for some 2 to 3 million silkworms.

As far back as May 1915, a supply of disease-free eggs of the best varieties had been ordered from Europe. They reached the Simla Silk School in October, and were there hibernated in a special machine provided for the purpose.

This preparation for the silkworm industry is of recent introduction, but it is an important link in the successful rearing of the best varieties. It helps to ensure a vigorous race of worms, which will produce cocoons rich in silk, and also protects them from disease.

Special hatching machines of a simple pattern have been utilized by the Salvation Army during the last three or four years. The use of these and their value for hatching purposes will be demonstrated. They ensure uniform heat, and enable the eggs to hatch out simultaneously, thus avoiding much trouble, delay, and loss of eggs from chill.

Different systems will be demonstrated in the silk camp. The two chief dangers to be guarded against are excessive heat and excessive cold, with violent variation between the two. The various systems will be demonstrated, and the students, workers, and visitors will be allowed to judge for themselves which they consider best, or which will be most suitable for their own locality.

One large shed has been prepared on a system which guards both against cold and excessive heat. This has been introduced with great success at the Salvation Army silk farm at Moradabab. A trench is made about 100 feet long, 12 feet broad, and 3 feet deep. The excavated earth makes a wall about 3 feet high with a thick thatched roof, and a doorway at each end. In a dugout of this character worms have been successfully reared in the hot weather.

The Persian system of a shed on poles raised above the ground, where the air can freely percolate all round, and leaves can be stored underneath to get rid of extra moisture when there has been heavy rainfall, will also be demonstrated.

In Japan and Europe it is usual to rear the silkworms on shelves, carefully arranged, tier on tier. This economises space and gives the worms the best individual care. In Kashmir, and most parts of India, the worms are usually reared upon the ground, branchlets of mulberry twigs being heaped on top of each other. This ensures economy of labour—an important consideration. Instead of six or seven feedings during the twenty-four hours only two are necessary, morning and evening. The respective advantages of both systems will be demonstrated.

Besides the large sheds for the hatching of the worms, there are more than fifty tents for the accommodation of the workers of the staff, and for lectures and demonstration. The camp is already a hive of industry, with about 100 workers. It is intended to increase the number to 150, as the worms increase in size and need more attention. (*Journal of the Royal Society of Arts*, for August 25, 1916.)

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number puts forward ideas in regard to soil aeration. It is suggested that air might be definitely applied to the soil just as water and plant food are supplied, and thereby in certain circumstances, improve the fertility.

On page 387 three articles deal with the abnormal weather conditions experienced in the West Indies during October and November.

Information relating to sugar-cane appears on pages 388 and 389.

Attention may be called to the article under the general heading of Cotton, giving an account of the changes in cotton seed during storage.

Constructive Soil Ventilation.

West Indian agriculturists should not fail to give attention to what is said editorially in this issue on the subject of constructive soil ventilation. The past season has been everywhere an exceptionally wet one, and it would be interesting to consider whether any detrimental effect has been produced on crops through soil saturation, i.e., lack of aeration. The injurious effect of the rains has been recorded in relation to the washing away of soil and, in some cases, crops, to landslides and damage to roads, as well as to flowering and fruit-formation among crops. These are the mechanical effects of the rain to a large extent: not effects resulting from abnormal soil conditions. Any observations that have been made, which seem to have a possible bearing upon the importance of air in the soil, would be received with interest at this Office.

The West Indian Exhibit at the Canadian National Exhibition.

In the *Canada-West India Magazine* for September 1916, a full page is devoted to a description and illustrations of the West Indian Exhibit at the Canadian National Exhibition, arranged under the auspices of the Royal Mail Steam Packet Company, and which is said to have attracted the attention of many thousands of the visitors of this great annual show.

As is seen from the illustrations, the Company's booth was arranged in the form of a ship's deck, and the exhibits were displayed in the inside of the 'saloon'. The exhibits represented Demerara, Trinidad, and Barbados. No fewer than 50,000 booklets were distributed. The attendance at the exhibition was 910,000, as compared with 841,000 last year.

The exhibits included the following articles among others, sent chiefly by the Permanent Exhibition Committee of British Guiana: limes and lime juice products, cacao, sugar, rum, coco-nut products, rice and rice products, coffee, nutmegs, cassava starch and meal, rubber, and timber. There were also on show—hats, cigars, fruits, honey, jams, jellies, pickles and sauces.

The booklet entitled *The West Indies in Canada*, issued in past years by the Imperial Department of Agriculture for the West Indies, for distribution at the Exhibition, was this year suspended on account of the necessity for measures of economy consequent on the war.

Improvement of Sponge Cultivation in the Bahamas.

This Office has been furnished by the Colonial Office with a copy of a speech delivered to the Legislature of the Bahamas by the Governor, on the occasion of the closing of the session on August 1. Attention is called by the Colonial Office to the information given as to the sponge industry, which appears in the speech. This records the opinion that the marine potentialities

of the Bahamas are susceptible to very great developments. It has been found possible for the Government to send the Secretary of the Marine Products Board on a tour of inspection to the Experimental Sponge Farms in the vicinity of Sugar Loaf Quay, Florida, thanks to the courtesy of Professor A. J. Meyer. A report, which was the outcome of this tour, clearly indicates that the artificial cultivation of sponges can be made a profitable industry if conducted on scientific lines. It follows therefore, that 'The Mud' of the Bahamas is capable of offering in the near feature an extensive field for the investment of capital, as also remunerative results to both investor and sponger. During the year 1915-16, high prices were obtained for sponges, and this in itself will tend to stimulate the extension of sponge cultivation on scientific lines. In 1915-16, 1,628,938 lb. of sponges were exported from the Bahamas valued at £147,021, as compared with 1,142,547 lb. valued at £93,395 in 1914-15.

In past issues of the *Agricultural News* reference has been made to the efforts that are being made by the Imperial Department of Agriculture to introduce sponge cultivation into the Lesser Antilles. It may be stated that action is still being taken to bring this into effect, and with good prospects of success.

Department Publications.

The recently issued number of the *West Indian Bulletin* (Vol. XVI, No. 1) contains papers on original biological work conducted in the West Indies, and indicates a distinct advance in our knowledge of the subjects dealt with. This number also contains discussions, on points brought up at the Cotton Conference last March, received from Manchester. With this number has been issued the index and title page of Volume XV.

The Annual Reports of the local Agricultural Departments are now passing through the press. The Dominica, Grenada, and Montserrat reports, respectively, have already been issued, and the St. Vincent and St. Kitts reports should be in the hands of readers by the end of the year. These reports are for the year ended March 31, 1916. The present series is of a particularly high standard and indicates important advances in experimental and administrative work. The distribution of these reports is limited, but most of the information calculated to interest readers outside the islands is reproduced for their benefit in the *Agricultural News*.

Can Mules Breed?

The evidence for and against the possibility of fertility in mules is set out in an interesting article in the *Journal of Heredity* for November 1916. The general conclusion arrived at is that one should at present keep an open mind on the subject. Cases have been reported which have every aspect of being genuine, but supporters of the negative side of the question say that the observations have been faulty or inadequate. An interesting case of alleged fertility was recorded in the *Agricultural News* for September 27, 1913 (Vol. XII, No. 298), which is not mentioned in the article under notice. A female mule was stated to have produced a colt by a jack donkey, and the authenticity of the phenomenon was vouched for by a properly qualified veterinary surgeon.

The strongest negative evidence on the subject is physiological. When body cells divide, there is no preliminary pairing of the chromosomes, or minute bodies in the cell; but, when germ cells are formed, each chromosome pairs with its mate as a necessary preliminary to division. In the case of the pure species, this is a regular and orderly process. But in germ cell divisions of the mule this is impossible. One trouble is that the hybrid has received nineteen chromosomes from his dam, a mare, and thirty-two from his sire, a jack: and when the chromosomes come to pair off there are not enough of the right kinds to pair. In addition there is an incompatibility between those 'pairs' that are present, and pairing is difficult or incomplete. The whole machinery of the cells is therefore upset, and the cell itself destroyed.

The microscopic studies on which the above facts rest were made principally on the germ gland of the male. It is conceivable that matters might occasionally proceed differently in the ovary of the female, where a different chromosome constellation exists.

Manchester and the West Indian Cotton Conference.

Two important letters appear in the recently issued number of the *West Indian Bulletin*, one by Dr. Lawrence Balls, formerly Botanist to the Egyptian Government and now scientific adviser to the Fine Spinners' and Doublers' Association, and the other by J. W. McConnel, Vice Chairman, Fine Spinners' and Doublers' Association, Limited. In these letters appreciation is expressed of the general scheme of the Conference and the useful results that accrued from it. In the course of his letter, Dr. Balls urges that larger yields per acre should be looked for in the West Indies. He then goes on to sketch the ideal arrangement of an experiment station for the purpose of seed breeding. A few remarks then follow on the question of mutation, and the letter ends with observations relating to the measurement of lint.

Mr. McConnel refers to the kinds of cotton that are wanted by spinners, and he attaches importance to efforts at continuing to produce the satisfactory strains that are at present in existence. He regards as important regulating the quantity produced of extra-special types. The great defect of West Indian cotton is that it makes 'neps'. This is a definite thing for experiment workers to cure. As regards practical mill tests, there are difficulties in the way, and it is also hardly possible to furnish detailed information of the behaviour in the mills of particular marks of cotton. It is thought, however, that a limited number of samples of actual commercial crops could be added to the experimental samples which are subjected to special tests as described in the Annual Reports of the Agricultural Departments of the cotton-growing islands.

ROOT SYSTEMS AND LEAF-AREAS OF CORN AND THE SORGHUMS.

It is well known that the Sorghums, for example, Guinea corn (*S. vulgare*), withstand severe climatic conditions better than Indian corn (Maize). Experiments have been conducted in the United States to determine the fundamental characteristics of sorghum plants that enable them to do this. The experiments, which are described in the *Experiment Station Record* (Vol. 35, No. 5), had particular reference to differences in root systems and leaf-areas.

In all stages of growth the primary root systems were found equally extensive, but the secondary roots of the sorghum plants as compared with those of corn were twice as numerous per unit of primary root. Both primary and secondary roots of the sorghums were found to be more fibrous than those of corn. A study of the weight of the dry matter of the aerial portions and of the roots of mature plants showed an average ratio of the dry weight of the grain, stem, and leaves of standard Kafir to the dry weight of the roots of 15:1 and 14·9:1 in 1914 and 1915, respectively, while the dry weight of the stem and leaves of the same plants was, on the average, 10·9 times that of the root weight in 1914 and 10·1 times the root weight in 1915. The average ratio of the dry weight of the aerial portions of Dwarf Milo maize to the weight of the roots was found to be 15·7:1 in 1914 and 15:1 in 1915. The weight of the stem and leaves of the same plant was 9·6 times and 8 times, respectively, the weight of the roots for the two years The weight of the stem and leaves of Pride of Saline corn was 9·6 times the root weight in 1914 and 7·8 times the weight of the root system in 1915. The aerial parts of dwarf Blackhull Kafir corn in 1915 showed a weight of 15·7 times that of the roots, and the weight of the stem and leaves 8·9 times the weight of the roots. The results of experiments regarding soil moisture content and depth of root penetration seemed to show that under the existing conditions very little, if any, depletion of soil moisture took place below the depth of root penetration.

The leaf area of the corn plant at all stages of its growth was found to be approximately twice as great as that of Dwarf Milo maize, and never less than 1·5 times that of Blackhull Kafir corn. It was pointed out that the sorghums would have the advantage over the corn plant under any climatic condition tending to bring about a loss of water from the plants. The two sorghums as compared to the corn plant have only one-half the leaf surface exposed for the evaporation of water, and also have a root system which, judging from the number of secondary roots, would be twice as efficient in the absorption of soil moisture.

These results are of great interest. Similar experiments with varieties of sugar-cane resistant and susceptible to drought, would constitute a useful piece of work that might be conducted in the West Indies.

TESTING OF OIL-BEARING NUTS IN THE PHILIPPINES.

Investigations have been made by the Philippine Bureau of Science concerning the qualities of the calumpang nut, which has been found to be edible, though slightly purgative when eaten in quantities. The composition of the nuts, as analysed by the Bureau of Science, is: fat (by extraction of dry seeds), 51·78 per cent.; protein, 21·61 per cent.; starch, 12·10 per cent.; sugars 5 per cent.; cellulose, etc. (by difference) 5·51 per cent.; ash, 3·90 per cent.

The oil expressed from the calumpang is sweet, with a comparatively high melting-point. Its colour is a light yellow. One chemist reports that it appears to resemble olive oil very much in its physiological action. It is non-toxic, and has no irritating action. It can be used in the same manner as olive oil, and should be especially useful for culinary purposes.

Additional facts, writes the correspondent at Manila of the United States Department of Commerce, have also been ascertained concerning the oil-bearing nut, *Chisochiton cumingianus*, Harms., in recent investigations by local scientists. The plant belongs to the natural family in which the Philippine santol occurs. The nut is known in many parts of the islands, from northern Luzon to southern Mindanao. The name applied to it in Camarines and Laguna, 'balucanag', is taken to indicate that the natives recognize the nuts as oil-bearing, for the same name is applied to another and well-known oil-bearing nut, although the two are not alike in any other particular.

The *Chisochiton cumingianus*, Harms., is described as half ellipsoidal in shape, when fresh, and as averaging 3 centimetres (1·18 inches) in length, and 2·5 centimetres in width at the widest portion. The shell is rather hard, constituting about 60 per cent. of the total weight, and it is difficult to separate it from the meat. In a quantity of shelled nuts tested by the Bureau of Science, which used petroleum ether for the purpose, about 31 per cent. of the whole nut was a reddish-brown oil. The composition of the dry kernels was found to be as follows: fat (by extraction), 44·12 per cent.; protein, 9 per cent.; ash, 3·19 per cent.

The dry kernel yielded 35·36 per cent. of oil on expression. The oil had a rancid odour, and was non-drying. On experiment it was found to have purgative properties. This oil, however, was found to have a weaker laxative effect than castor oil, 5 parts of it being approximately equivalent to 1 part of castor oil. This oil, more commonly called cato, was found by the Bureau of Science to be valuable for soap-making. One local firm now employs the oil in that industry. (*Journal of the Royal Society of Arts.*)

Improvement of California Orange Groves.—Owners of the largest orange groves in Southern California have already adopted the plan of keeping a record of the performance of each individual tree, and eliminating any trees that do not prove to be good producers, usually by top-working them with select buds. So far, however, it has not been found possible to get many of the owners of small groves to adopt this process. The California Fruit Growers' Exchange is now planning to assist the growers in securing the record of trees in these small groves, taking advantage of the fact that small growers do not pick their own fruit, but entrust the task to the local association of the exchange, which sends out a trained gang of men to pick the fruit. It is now proposed to add to each picking crew a man whose duty will be to make a record of the production of every tree: and this report, furnished to the owner of the grove, will enable him to supplant the bad yielders with trees of a better strain, in many cases by top-working the drone or undesirable individual tree. The exchange has for several years been working on the standardizing of the citrus 'pack'; a co-operative and organized effort is now being made to standardize the 'production'. (*The Journal of Heredity*, November 1916.)

DISTINGUISHING CHARACTERS OF THE SEEDS OF SUDAN GRASS AND JOHNSON GRASS.

The close relationship of Sudan grass and Johnson grass leads to a pronounced similarity in their seeds. The two kinds of seed can be distinguished, however, when their comparative size and certain features of their appearance due to differences in development are considered. These are set out usefully in *Bulletin No. 406*, United States Department of Agriculture. The information is important to the West Indies owing to recent discussions that have arisen on the subject.

Sudan grass seeds in the hull vary from eighteen one-hundredths to twenty-five one-hundredths of an inch in length, exclusive of the short stem. Most of the seeds bear at the base of each a short stem which is jaggedly broken at its extremity. This stem represents the upper portion of a rachis segment, and is expanded at its articulation with the spikelet, or seed. The articulation may be marked by a slight constriction, but it has no distinct suture. The appendages of the spikelet usually are jaggedly broken and not expanded at the apex. The missing portion corresponds to the short stem of the spikelet described.

The seed hull is mainly straw-coloured or light tawny. Many seeds are tinged or spotted with brown. Some are tinged or spotted with red. The darkest are blackish-brown. In general, commercial seed has a smaller proportion of red-dish and blackish-brown seeds than Johnson grass. The hulled grains vary from thirteen one-hundredths to eighteen one-hundredths of an inch in length, and are light reddish-brown. They are larger, more commonly elliptical in out-line, and lighter-coloured than in Johnson grass. Even in the smaller grains the embryo is relatively larger than that found in Johnson grass seeds.

Johnson grass seeds in the hull vary in length from fifteen one-hundredths to twenty-two one-hundredths of an inch. Most of the seeds have a smooth, rounded, and light-coloured scar at the base. The appendages of the seed are mostly entire, expanded, cup-shaped, and smooth at the apexes, corresponding with the scar at the base of the seed. The uniformly smooth border of the expanded, cup-shaped apex, together with the smooth seed scar, results from the normal separation of the seed along a definite suture.

The prevailing colour of mature seed hulls is blackish-brown. Many seeds are partially or wholly reddish. Some are straw-coloured. A few are tawny or light-brown.

The hulled grains vary from eight one-hundredths to twelve one-hundredths of an inch in length. They usually are oval, sometimes oval-elliptical in outline, the embryo end tending to be the more pointed. The colour is dark reddish-brown. They are noticeably smaller and darker-coloured than those of Sudan grass, and have a relatively narrower embryo.

The Antigua *Sun* has given publicity to the letter sent by the Commissioner of Agriculture to the Government in regard to the high price of wheat flour and the growing of substitutes. In Antigua, it is stated that the inhabitants are already feeling the high price of flour acutely, and it is believed that there are harder times in store in the near future. It will be remembered that extended cultivation of Indian corn, Guinea corn, and ground provision crops has been recommended.

AGRICULTURAL CADETSHIPS IN GRENADA.

In the last issue of the *Agricultural News* was published an account of the instruction given to agricultural pupils at the Botanic Gardens, Dominica. The following is an account of the educational work arranged for in Grenada in connexion with the Agricultural Department and the Government Gram-mar School:—

A new scheme of Agricultural Cadetships will be brought into operation in the next financial year, with the definite object of providing a training for a limited number of eligible young men who are able to satisfy the authorities that they intend to take up agricultural pursuits in the Colony, on completing their course of training.

The main features of the new system are that the cadets, who will be selected on the joint recommendation of the Superintendent of Agriculture and the Head-master of the Grenada Boys' School, will undergo a course of Agricultural Science at the Secondary School for one year. During this year they will each receive a grant of £24.

In the second year a similar grant will be given, and the cadets will be attached to the Department of Agriculture for instruction in the practical work of the Botanic and Experi-ment Stations.

During the third year the cadets will be attached to estates, for the purpose of learning practical estate work and the management of labour. The estates will provide lodging for the cadets who will continue in this year to receive the grant of £24 from the Government.

The examinations of the Imperial Department of Agriculture will be used as a means of testing the progress of the cadets throughout their course. During the second year the Preliminary Examination will be taken, and at the end of the course the cadet must pass the Intermediate Examination of the Imperial Department of Agriculture. If a cadet fails in the latter he will be given opportunity of a second trial, and his cadetship grant will be continued for another twelve months if necessary, three months of the extended period to be with the Superintendent of Agriculture, and the remainder on an estate. A cadet on passing his Final Examination will be granted a certificate as an Overseer, by the Board of Agriculture.

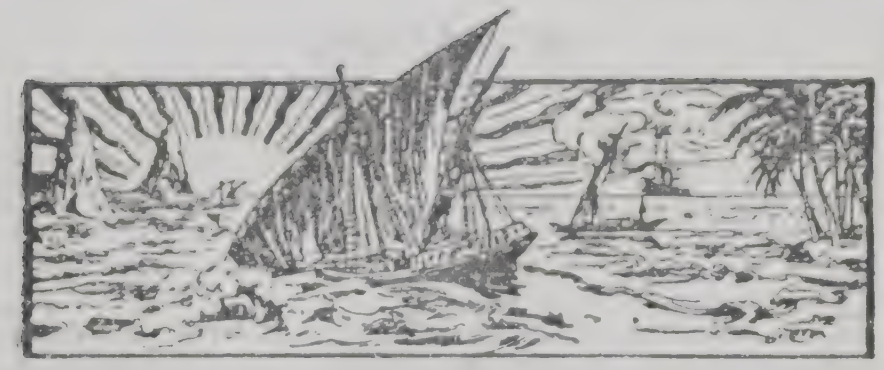
The cadets will be required to enter into a contract, with two responsible sureties, guaranteeing to return the amount expended by the Government if they fail to complete the course laid down.

It is intended to offer two cadetships each year.

The selection of cadets will be made from candidates who have passed the Junior Cambridge Examination.

In order to fit in with the school course and the Imperial Department examinations, it is intended that the cadetships shall start with the school year in September.

The above scheme has not yet been put into effect owing to the cessation of science teaching at the Grammar School consequent on the resignation of the Head-master.



GLEANINGS.

In the *St. Lucia Gazette* for November 11, 1916, a Proclamation appears containing the regulations regarding the maximum price of foodstuffs in St. Lucia. The maximum price of flour (white) is fixed at $3\frac{1}{2}d.$, white loaf sugar $5\frac{1}{2}d.$, and corn meal $2\frac{1}{2}d.$ per lb., respectively. The prices vary according to distance from Castries, the principal town.

Experiments on the manuring of maize, described in the *Rhodesia Agricultural Journal* for August 1916, show that the same land that receives a dressing of manure the previous year is capable of still producing large increases in the yield of maize by virtue of residual value. This opens up the question as to whether the application of manure is worth while every year.

According to a paper in the *Journal of Agricultural Research* (Vol. VII, No. 2), on the immobility of iron in plants, various observations on rice and pine-apples grown with insufficient iron seem to show that iron after once being transported to the leaves is immobile. In a general way it would appear that once iron has reached the leaves of plants it is not translocated to other parts of the plant.

The Colonial Journal for October 1916 contains notes of interest to the West Indies. Reference is made to the sugar industry from various points of view, including the need for more central factories, together with the economic changes pending in Jamaica in regard to the substitution of sugar-cane for bananas. An interesting business note appears on the running cost of motor vehicles, which has particular reference to motor lorries.

According to *The Times*, it appears that Glasgow has been making requests for larger supplies of sugar. The Sugar Commission have stated that they would be glad to increase supplies available for consumption, but having regard to the paramount necessity of restricting the amount of tonnage required for the transport of sugar, they do not feel it would be to the national interests for supplies to be increased at the present time.

In connexion with the possible shortage of foodstuffs in the West Indies, the Antigua Agricultural Department has issued a leaflet describing the useful characters of the different provision crops produced locally, and giving directions as to the preparation of these foodstuffs for consumption. It would appear that all the islands working in conjunction with the Imperial Department of Agriculture are fully alive to the need for preparedness in regard to the local supply of food

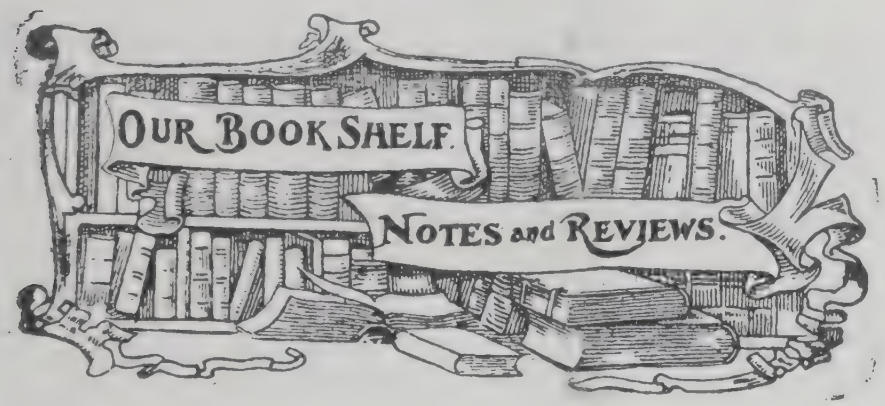
Institutions and business establishments which employ a considerable number of youths between the ages of fifteen and twenty will be interested to learn of a scheme of education adopted by the Municipal Council of Johannesberg, at their Abattoir and Live Stock Market. On the recommendation of the Council, the Education Department conducts classes at the Abattoir, thus giving these youths an opportunity of improving their education and fitting them for responsible positions in various walks of life. This matter is referred to in the report of the Director of Abattoir and Live Stock Markets, July 1, 1914, to June 30, 1915.

Much attention has been given in the rubber journals to a paper by a Russian chemist on the mechanism of the process of vulcanization of caoutchouc. In this paper it is maintained that the vulcanization of rubber can be effected without sulphur. This is an important discovery. It seems that an organic compound can be used instead, and apparently more cheaply and effectively. The actual success of the process from a manufacturing point of view has not yet been established. For full information see the *India Rubber Journal* for September 30, 1916, or the *India Rubber World* for November 1, 1916.

The rearing of Angora rabbits for their wool is the subject of a useful article in the *Journal of the Board of Agriculture* (England and Wales) for October 1916. The housing and feeding of these animals together with plucking the wool and the marketing of it are described in detail. As the Angora is very susceptible to cold, and warm housing is essential in a temperate climate, the production of these animals might form a minor industry in the West Indies. There seems to be a special demand for the wool at the present time, and the raising of these animals can undoubtedly be made a very paying business: but it is advisable to start on a small scale first.

The first Annual Report of the Committee of the Privy Council for scientific and industrial research was published in September, and has created widespread interest not only in England but also in other places. The observations and recommendations, while more directed to industrial conditions in England, possess significance in regard to agriculture and research in the West Indies. The various Governments have been furnished with copies of this report. The London *Chamber of Commerce Journal* states: 'The best scientific and technical education for all engaged in industries and manufacture is required, and this able report will be most helpful and suggestive to those who desire that Great Britain shall retain her high place as a manufacturing country.'

Useful at the present time when attention is being given to the production locally of food and fodder crops is *Farmers' Bulletin No. 774*, United States Department of Agriculture, dealing with the feeding of grain sorghums to live stock. The section dealing with the value and use of the grains states that very often the entire heads are ground up, producing a feed of greater bulk, while the meal resembles corn and cob meal in food value. It is desirable at the present time in the West Indies to use Guinea corn for purposes of human consumption as far as possible, but its value as a stockfeed may be borne in mind, particularly in regard to the coarser varieties, or where there has been a partial failure of the crop, making the threshing and winnowing scarcely worth while.



SULPHITATION IN WHITE SUGAR MANUFACTURE. By Francis Maxwell, London: *Norman Rodger*, 1916. Pp. 72. Figs. 8 + Plates III. Price 7*s.* 6*d.* net.

The shortage in white sugar since the war has not been due so much to actual shortage in raw sugars as to lack of refining facilities. This circumstance lends additional importance to the manufacture of plantation white sugar. Up to the present, Java, Mauritius, and Louisiana are the only places where the sugar-cane factory has been equipped for turning out this grade of sugar; it is likely, however, that the production of white sugars on the plantation will extend to other places in the future.

The present volume constitutes a useful source of information regarding the simplest form of refining process—Sulphitation. The information given is of a simple character, clearly and conveniently arranged, and should prove extremely helpful to the factory worker. The principal points dealt with are the preparation and properties of sulphurous acid; generating plants and their control; action of the acids on juices; application of sulphitation to juice; and sulphitation of the syrup and molasses. A special chapter is written on the sulphitation process in practice, and a description is given of the process as adopted by the leading white sugar countries. An original feature of the book is the summary, which is in the form of questions and answers. The questions are such as would be asked by the practical worker in his training in sulphitation, and the answers are obviously the replies of an expert thoroughly familiar with the various operations involved.

FIXATION OF ATMOSPHERIC NITROGEN. By Joseph Knox: *Gurney and Jackson's.* Chemical Monographs. London, 1914, Price 2*s* net.

This book gives an account of the more important processes for the fixation of atmospheric nitrogen, and more especially of the theory on which they are based. The methods described are those which were in actual operation at the time of writing. Since then, there have been important developments in Germany whose supply of nitrate for munition purposes depends almost entirely upon the fixation of atmospheric nitrogen.

It has been suggested that some of the water power at present running to waste in islands like Dominica and Grenada, in the West Indies, might be utilized to generate electricity for effecting fixation. Lime for neutralizing the nitric acid would be readily obtainable, and it might be possible to produce nitrate of lime for manurial purposes and for export. From the West Indian point of view this book is of particular economic and agricultural interest.

THE PROGRESS OF LAND SETTLEMENT IN GRENADA.

The year 1915-16 saw considerable activity in regard to land settlement in Grenada. An account of what was achieved appears in the Report of the Agricultural Department for 1915-16. According to this, the estate known as the St. Cyr Mountain Lands, situated about 10 miles from St. Georges, was acquired by the Government for land settlement purposes, for £2,814 plus the cost of survey, and road construction, etc., which bring up the total cost to £3,597 10*s.* The roads made throughout the settlement for the purpose of giving access from every lot to the bye-ways of the district cost £235, and are of a total length of 3½ miles. The construction of these roads, also of a 1½ mile connexion passing through the settlement and joining up the Beauregard and Adelphi bye-ways, was carried out by the Agricultural Department.

There are thirty-six lots containing bearing cacao or mixed cacao and nutmeg trees varying in quantity from ¼-acre to a whole lot, but only a few of them are entirely under these crops. The remaining eighty-four lots were under either bush or forest. The lots average about 2 acres each.

The sale prices of the lots containing cacao ranged from about £14 to £35 per acre, according to the number and condition of the trees; and the uncultivated lots were sold at £10 10*s.* and £12 per acre. The allottees of the higher-priced lots containing cacao were required to pay not less than a deposit of 1*s.* 3*d.*, the total value of the lot, with the balance to be paid in five annual instalments.

The empty lands were sold on the usual land settlement terms of one-fourth or one-twelfth deposit of the value, with the respective balances payable in nine annual instalments commencing three years from the date of allotment, and in eleven annual instalments commencing twelve months after allotment. Interest at 5 per cent. per annum is charged an all unpaid instalments.

A special committee of the St. Andrew's District Board—the parish in which the settlement is situated—kindly co-operated with the Agricultural Department in the selection of the most desirable settlers. In this connexion, 291 applications were dealt with.

The Superintendent's report on the valuation of the lots for sale was submitted in March 1915; the first batch of applications was dealt with in April, and by the close of the year under review, practically the whole of the lots on the settlement were allotted and occupied. With the exception of a few of the later settled lots, they are being worked, and on some of them very good progress has been made. These results are, on the whole, very satisfactory, and reflect the activity of the Department which, while understaffed, has been responsible for the work.

The estate is well watered by four tributaries of the Fond Perdu River; the climate is humid, the rainfall being estimated at about 100 inches per annum.

The soil is, on the whole, a fairly deep loam, dark-brown in colour, or a red clay subsoil interspersed with boulders about 2 feet below the surface, and here and there cropping out. The subsoil is rather close-textured, but the surface soil is fairly friable, and in this respect is amenable to improvement by tillage and drainage. It is well suited for the cultivation of ground provisions. The cacao can be considerably improved, particularly by attention to the drainage of the land and building up its permanent fertility with supplies of organic matter.

With the exception of the south-east corner of the estate the land is fertile. There are two warm mineral springs, one in the river, and one at the western end of the estate.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. In his report for October, Mr. J C. Moore, the Superintendent of Agriculture, states that general progress in the Experiment Stations is satisfactory. Plant distribution included the following: limes 1,350, coco-nuts 6, various 18. In the Botanic Station routine work in the nurseries and grounds was maintained. Referring to staple crops, cacao and limes are reported as satisfactory, on the whole, while the condition of the cane crop remains normal. Experiments in the preparation of hat straw from *Carludovica palmata* are in progress. The Agricultural Instructors are advising peasants to plant extensively, cassava, corn, potatoes and other provisions, in anticipation of shortage of bread and wheat flour. Owing to the departure of Mr. Hedog Jones, science teaching at the Grenada Boys' School is in abeyance. This has caused delay in the beginning of work under the new agricultural cadetship scheme. Heavy rains were general from the 6th to the 8th, and on the 19th and 20th of the month, while high winds occurred on the 7th. Mr. Moore mentions as work contemplated, the storing of 60 barrels of native seed corn, for distribution at cost during the 1917 Spring sowing season, as a precaution against any shortage due to peasants overdrawing on their stored corn for food purposes.

ST. VINCENT. Mr. W. N. Sands writes to say, it is feared that the heavy rainfall of the second half of the month (October) will cause a considerable amount of damage to the cotton crop. Small pickings of cotton have been made. Sugar-cane promises well. The reaping of arrowroot was retarded on account of the wet weather. Special attention was devoted to questions connected with the kiln-drying and storage of corn at the Government ginnery. The work of eradicating silk-cotton and 'John Bull' trees was continued by the Inspectors in the Leeward and Windward Districts. A large number of trees of both kinds were destroyed. The Agricultural Superintendent visited Young's Island and Calliaqua district in connexion with this work. In the Experiment Stations and Botanic Gardens work consisted of a general routine nature; 75 lb. of selected Indian corn was distributed. The rainfall at the Botanic Station was 15·97 inches, and at the Experiment Station 17·54 inches.

DOMINICA. In Mr. Jones's report for October, it is stated that on most estates the lime crop for the present is over and the trees are flowering lightly. Planters are busy clearing up their fields. The local price for ripe limes has risen to 5*s.* per barrel. Twenty five thousand lime plants have been offered for sale, and the plant distribution indicates a certain renewal of activity in planting. The plant distribution was as follows: limes 6,225, cacao 225, shade trees 150, budded citrus 121, miscellaneous 42, making a total of 6,763. The work of clearing the Gardens has been completed; new species have been planted out, and attention is now being given to repairing the nursery sheds and fences. The question of forming an Agricultural Co-operative Society at Grandbay for working a lime factory, formed the subject of a special communication after a visit to the district. The opportunity was taken to explain to the people the probable rise in the price of flour, as mentioned in a letter from the Imperial Commissioner. A tour of the most seriously damaged properties by the recent hurricane has been completed and a report submitted, which is dealt with on another page in this issue of the *Agricultural News*. Work in the chemical laboratory during the month was confined to the testing of several samples of lime juice for planters. The rainfall for the month was 10·06 inches.

MONTSERRAT. Mr. W. Robson's report for October states that the following were included in the plant distribution: lime plants 1,180, bay plants 3,350, cane plants 570, English vegetable seeds 86 packets, sword beans 4½lb. The total number of bay plants sent out is 14,000, and the Curator adds that the orders for bay plants invariably exceed the number of plants that can be raised. In the Botanic Gardens the cotton-breeding plot has given a large return, ¼-acre yielding at the rate of 392lb. lint per acre, with H.9, No. 23, at 500lb. lint per acre. The rainfall is considered to have just suited the development of the plants. Five distillations of bay leaves have been made, making a total of 5,500 lb. of leaves reaped from the Chateau plot, for 1916. Six gallons of bay oil from this plot were shipped to England. Regarding staple crops, it is stated that a dry month would have suited the cotton crop better than one of excessive rain, and a large amount of cotton has been lost on account of the wet weather, chiefly through the disease known as soft boll rot. As the result of the bad weather the crop is not estimated to be above the average. At the close of the month 320 bales of cotton were shipped to England. The price paid for peasants' seed-cotton still remains at 4*d.* per lb. The major portion of the lime cultivation at Roches is in as vigorous a condition as could be wished. A suitable soil, in a well sheltered valley, aided by the close proximity of the forest with its attendant humidity, says Mr. Robson, is the obvious reason for success of limes at this place. There would seem to be quite a large area in the Roches and Tar River districts that could be usefully planted in limes. It appears that, on the whole, the cultivation of onions will be more successful than it was last year; the damping off of seedlings is not so prevalent.

Fourteen samples of the lint of the various strains of cotton grown were submitted to the British Cotton Growing Association for report and valuation. In addition, five samples were prepared and sent on for spinning tests. The analysis to show the purity of the various strains cultivated has been practically completed. This has involved the examination of 400 plants for lint length and percentage of lint. The examination of sixty plants of the St. Kitts 342 strain still remains to be done. Self-fertilized seed of all the plants examined is on hand. Circular letters have been addressed to 100 of the leading planters in regard to the shortage of wheat flour, and the necessity for growing food crops The attitude of the small growers to the Montserrat Onion Growers' Association is said to be discouraging, and the opinion is expressed that it will probably take some years for them to see the benefit of the association. The rainfall for the month at Grove Station was 19·43, and at Harris's 15·64 inches. On the 30th, 7·59 inches were recorded. This heavy fall seemed to have been local, as at Windward only 1½ inches were recorded.

ANTIGUA. In his items of news for October, Mr. T. Jackson states that heavy rains have prevented the cultivation of the sugar-cane plots at Skerretts. Plant distribution

consisted of 28,650 onion plants, 2,286 eucalyptus, 100 coco-nuts, 95 Prosopis, 50 limes, 37 miscellaneous economic, 12 decorative, and 84 cuttings. In addition 110 packets of vegetable seeds were sent out; 1,000 seed coco-nuts were imported. In the Botanic Garden large numbers of young eucalyptus were lost on account of heavy rains. Touching staple crops, it is stated that in some places the young cane crop is suffering from a superabundance of water. On the whole, however, the cane crop is making rapid growth. Large numbers of cotton bolls were shed during the latter part of the month. The planting out of onion seedlings has been general throughout the island. Germination was good, and the loss in numbers, due to damping-off fungus, considerably less than in last year. Some attacks of cotton caterpillars have been experienced. A leaflet on the possible scarcity of food in Antigua has been compiled. The rainfall for the month was 13·16 inches. The heavy rains which have fallen have retarded the cultivation of land.

Attached to the Curator's report is a short report on the work of Agricultural Instruction for the month. In this it is stated that early planted cottons have suffered somewhat during the month from the recent high winds and heavy rains. Boll shedding is common, and severe attacks of caterpillars have also been experienced. One peasant has taken up the cultivation of onions and has purchased 5,000 seedlings from the Botanic Station. During the month the peasants' attention was drawn to the possible shortage of food supplies in Antigua in the near future, and they were advised as to the desirability of the immediate planting of increased areas of corn, sweet potatoes, cassava, and peas and beans. In this connexion 10 packets of rounceval peas were distributed amongst the larger growers who had available land at their disposal.

NEVIS. Mr. W. I. Howell reports that the cane crop is looking green, but in some places is disappointing, as despite the fine weather the canes are not making much growth. Cotton is ripening but a great part of the crop in some districts has been damaged by the weather, the rains being so continuous that the crop could not be reaped. The storm of October 10 also did considerable damage to the cotton crop along the seacoast. Cotton stainers are fairly plentiful in some fields. The onion crop is doing well; provision crops also continue to do well; a large acreage was planted in sweet potatoes during the month: 5,850 sweet potato cuttings and 4,950 onion slips were distributed from the Botanic Station. The rainfall for the month was 10·86 inches, and for the year to date, 52·56 inches.

THE ENEMIES OF BACTERIA IN THE SOIL.

The conclusion that microscopic, unicellular animals known as protozoa bring about a reduction in the number of useful bacteria in the soil was put forward by Drs. Russel and Hutchinson, of Rothamsted, England, in 1913. This conclusion was much criticised in the United States, and led to much work being done in various places in regard to the subject. The following summary of a paper by Waleman in the American journal, *Soil Science* (October 1916), shows that further experimental support of the above theory has been obtained: —

The presence of protozoa seems to check the bacterial numbers, which are found to be smaller in the soils where the protozoa are present than in the corresponding soils where they are absent.

The ammonifying efficiency of the soil does not go hand in hand with the changes in bacterial numbers.

Heating the soil at 65°C. for five hours destroyed the protozoa in all instances but one, and greatly reduced the bacterial numbers; but when proper moisture was added and the soils were allowed to incubate for thirty days, the bacterial numbers increased to almost three times those of the check. There was a corresponding increase in ammonia production in the soil.

The action for forty-eight hours of 4 per cent. toluene, which was then allowed to evaporate for forty-eight hours, killed the ciliates, but not the flagellates; this treatment also reduced the bacterial numbers, but they at once increased after the toluene was allowed to evaporate.

The action of toluene and heat is greatest upon soils having a high content of organic matter, whether the protozoa are active or not.

The Sassafras soils kept out-of-door gave higher bacterial numbers and higher ammonifying efficiency than those kept under laboratory temperatures, and the latter gave higher numbers and ammonifying efficiency than those kept at 30° C.

The soils with the optimum moisture gave, in the main, higher bacterial numbers and ammonifying efficiency than those containing full-moisture-holding capacity.

There may be two types of protozoa in the soil, one injurious to bacteria and to soil fertility, and the other uninjurious and perhaps even beneficial. The beneficial influence of antiseptics upon soil may be due to the killing of the first type of protozoa.

There are, however, other factors, which point out that the improved soil conditions brought about by the action of heat and antiseptics may be due to the improvement of conditions for other organisms, such as fungi, to work in the soil; or the soil itself may be changed in such a manner as to offer new conditions to its micro-organic population.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Thursday November 30, by the C.R.M.S. 'Caraquet' for the purpose of paying a visit to Trinidad. Dr. Watts expects to return by the C.R.M.S. Caraquet on December 14.

Mr. W. Nowell, D.I.C., Mycologist on the Staff of the Imperial Department of Agriculture, returned to Barbados from St. Vincent by the C.R.M.S. 'Chaudiere' on November 29.

Dr. J. C. Hutson, B.A., Ph.D., arrived in Barbados by the S. S. 'Parima' on the 27th., and has assumed charge of the entomological work of the Department pending the return of Mr. H. A. Ballou, M.Sc., from Egypt.

MARKET REPORTS.

London.—The West India Committee Circular, October 5, 1916.

Arrowroot—2½*d.* to 4¾*d.*
Balata—Sheet, 3/3 to 3/6; block, 2/3½.
Beeswax—No quotations.
Cacao—Trinidad, 84/- to 85/-; Grenada, 72/6 to 73/-; Jamaica, no quotations.
Coffee—Jamaica, 65/-.
Copra—£32.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—Bananas, £17 per ton; Oranges, Jamaica, 16/- to 18/- per case.
Fustic—No quotations.
Ginger—Jamaica, no quotations.
Isinglass—No quotations.
Honey—Jamaica, 35/- to 45/-.
Lime Juice—Raw, no quotations; concentrated, £22; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6*d.* to 2*s.* 2*d.*
Nutmegs—5¾*d.* to 1*s.* 2*d.*
Pimento—3⅛*d.* to 3½*d.*
Rubber—Para, fine hard, 3*s.* 2½*d.*; fine soft, 2/11; Castilloa, no quotations.
Rum—Jamaica, 3/11 to 5/7.

New York.—Messrs. Gillespie Bros. & Co., November 14, 1916.

Cacao—Caracas, 15¼c. to 16c.; Grenada, 15c. to 15¼c.; Trinidad, 15½c. to 15¾c.; Jamaica, 11¾c. to 12¾c.
Coco-nuts—Jamaica and Trinidad selects, $42·00 to $43·00; culls, $20·00 to $22·00.
Coffee—Jamaica, 9½c. to 11½c. per lb.
Ginger—14½c. to 17½c. per lb.
Goat Skins—Jamaica, 70c.; Antigua and Barbados, 68c. to 70c.; St. Thomas and St. Kitts, 50c. to 68c. per lb.
Grape Fruit—Jamaica, $2·50 to $3·00.
Limes—$4·00 to $5·00.
Mace—45c. to 50c. per lb.
Nutmegs—16c. to 17c.
Oranges—$2·25 to $2·75.
Pimento—5¼c. to 5⅜c. per lb.
Sugar—Centrifugals, 96°, 6·52c; Muscovados, 89°, 5·76c.; Molasses, 89°, 5·64c. all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., November 9, 1916.

Cacao—Venezuelan, $14·25 to $14·50; Trinidad, $14·00 to $14·50.
Coco-nut Oil—$1·03 per Imperial gallon.
Coffee—Venezuelan, 14c. to 15c.
Copra—$5·75 to $6·00 per 100 lb.
Dhal—No quotations.
Onions—$4·50 to $5·00 per 100 lb.
Peas, Split—$10·00 per bag.
Potatoes—English, $5·00 per 100 lb.
Rice—Yellow, $7·50 to $8·00; White, $7·40 to $7·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., November 1, 1916; T. S. Garraway & Co. October 30, 1916.

Arrowroot—$5·00 per 100 lb.
Cacao—$14·50 to $15·50 per 100 lb.
Coco-nuts—$24·00 husked nuts.
Hay—$1·75 to $1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, quotations; Sulphate of ammonia, $105·00 per ton.
Molasses—No quotations.
Onions—$4·75 to $5·00.
Peas, Split—$9·50 to $9·65 per 210 lb.; Canada, $6·00 per 120 lb.
Potatoes—Nova Scotia, $4·25 to $4·75.
Rice—Ballam, $6·30; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $5·00 to $5·25.

British Guiana.—Messrs. Wieting & Richter, October 31, 1916; Messrs. Sandbach, Parker & Co. October 20, 1916.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00	$12·00
Balata—Venezuela block	——	——
Demerara sheet	$65·00	68c.
Cacao—Native	12c. per lb.	14c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$20 to $24 per M.	$24 per M.
Coffee—Creole	14c.	16c. per lb.
Jamaica and Rio	15c. per lb.	17c. to 18c.
Liberian	11c.	13c.
Dhal—	$6·50 to $7·25	$6·50 to $7·25
Green Dhal	——	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	2c.	——
Madeira	4c.	4c. to 4½c.
Peas—Split	$12·00 to $12·50	$12·00
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·75 to $6·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·16	——
Rice—Ballam	$6·00 to $6·50	——
Creole	——	$5·50 to $6·00
Tannias—	$2·88	——
Yams—White	$2·88	——
Buck	$3·12	——
Sugar—Dark crystals	$4·50 to $5·10	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	$7·00	——
Molasses	——	——
Timber—Greenheart	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Rush to Plant Sugar-cane.

IT will be admitted everywhere that the West Indies have experienced an extraordinary stroke of good fortune in that favourable growing seasons and high prices for sugar have prevailed for the last two years since the beginning of the war. It is only to be expected that such conditions should render cane cultivation an attractive proposition and should tend to obscure the minds of those interested in this crop as to other aspects of the agricultural situation.

In considering the cases of those islands with which we are more intimately associated, a strong tendency to plant up all available land in sugar-cane has been and continues to be in existence. In Barbados, the area under sugar-cane reaped in 1916 was about 36,000 acres or an increase of about 2,000 acres. Most of this increased acreage was previously under cotton. In Barbados there has also been a tendency for the peasant to plant his land in sugar-cane at the expense of Indian corn and ground provisions. These extensions have taken place in an island where normally agricultural conditions are thoroughly established.

In less developed islands the changes might be expected to be more pronounced. This is so in St. Vincent, where the area now being planted in sugar-cane is actually threefold what it was two years ago. Extensions have also been made in smaller islands like Montserrat and Nevis, where, since the war, old muscovado plants have been opened up again and the necessary area of sugar-cane planted to supply them.

The increased interest that is being taken in sugar-cane is well reflected by the distribution of plants from the various Botanic Stations. It will perhaps serve a useful purpose to quote a few figures. In St. Vincent in 1913-14, the number of cuttings distributed was 8,500; in 1914-15, this jumped to 17,550; while in 1915-16 the high distribution was fairly well maintained at 14,900 In St. Lucia, during 1915-16, 3,000 cane cuttings were distributed to Crown land purchasers against nil the previous year. In Antigua, in 1915-16, the number of cuttings distributed was 254,617, which is about double the normal distribution. The case of Montserrat is even more striking. In 1913-14 there were 2,332 cane cuttings distributed; in 1914-15, 11,900; and in 1915-16, 17,676.

The revived interest which these figures and the previously mentioned facts convey, is obviously the outcome of the favourable conditions of production, recorded at the beginning of this article. The position of the grower is perfectly understandable: chances (of none too frequent occurrence) are in favour of big profits from cane cultivation, and the grower is seizing and rightly seizing his opportunity. But from a colonial point of view, from the point of view of the community, it is well to acknowledge the fact that the rush to plant sugar-cane is merely to fill a partial vacuum produced by the war, and it is well to remember that this, like conditions of climate, may change at any moment. The results might then be disastrous.

In the West Indian islands the production of sugar and of most other products too, presupposes a condition quite distinct from market prices and the season. It depends upon adequate shipping facilities. Upon this also rests the food supply of the islands. High freights are being felt acutely already, but if there should be an actual dearth of steamers so that produce could not be shipped, then whatever rates might be offered, neither sugar could be sold nor food supplies bought. The suggestion of such a situation arising may seem quite unwarranted to many, but recent events compel us to have regard to possibilities, however remote. The renewal of enemy submarine warfare in the North Atlantic, the strong German influence in South as well as North America, and the sudden decision of an important steamship line to stop calling at Barbados are matters which do not add to our feeling of security. And all the time the shortage of tonnage is being more and more felt by Great Britain and her Allies, half of whose carrying trade is already in the hands of neutral countries.

Under these circumstances greater efforts should be made to produce more in these islands for local consumption. This does not refer merely to the production of provision crops, though that occupies a front position, but it refers to a general organization of local food supplies and local industries.

The question of extending the area under crops that will yield substitutes or partial substitutes for the wheat flour at present imported has already been dealt with fully in this Journal. In this connexion it is not enough for the peasant alone to follow this policy: the large owner should also respond and grow a certain acreage of some cereal like Indian corn or Guinea corn, or else ground provisions such as yams or sweet potatoes. Shortage of labour is being felt in many parts of the West Indies: with the unusually heavy crops of sugar-cane and the ever-rising price of foodstuffs, the planter who can offer a labourer a reasonable wage, and is in a position to sell him as much corn meal as he wants at a lower price than that at which it can be obtained from the merchants is the planter who will secure the necessary labour.

More might be done to improve the methods adopted in the production of animals. Greater attention might be given to the economic feeding of cattle, sheep and poultry; and many more pigs might be raised with the object of making bacon and hams for local consumption, and for producing pork to take the place of that which is imported from America.

The fishing industry might be better organized in many of the islands. In Barbados, even, where it is an industry of considerable importance there is no attempt at organization. It seems strange that a colony should leave its marine resources which have not yet been even fully developed, entirely in the hands of its poorest and most ignorant inhabitants. Agricultural societies should extend their functions to include a general supervision of fisheries, or the Departments of Agriculture might do this in an official capacity.

Important items of importation into the West Indies are tobacco, spirits and motor fuel. Tobacco that would take the place of the lower grades consumed might very well be grown and cured in several of the islands, while the more general consumption of rum in place of other spirits would reduce the importation of spirits from abroad. As to petrol, the West Indies are fortunate in having a supply in Trinidad, but it would save shipment and probably be found cheaper all round to produce alcohol from molasses locally, in accordance with the methods successfully adopted in Natal.

Inter-island or intercolonial trade should be developed to the greatest possible extent, because this can be carried on by means of schooners. Already these islands are supplied with rice from Demerara in place of that which used to come from India, and on a smaller scale Antigua is beginning to capture the intercolonial markets for onions. Similarly the supply of fruit comes largely from intercolonial sources, oranges from Trinidad and Grenada, and limes from Dominica. This kind of business is to be encouraged at the present time as it tends to strengthen the economic independence of the West Indies.

The enticing aspects of sugar-cane cultivation have been shown to be responsible for considerable extensions of the area devoted to this crop. Some of this land was previously under cotton, and this fact brings up a point of special economic importance. It seems that owing to an unfavourable season there is likely to be a shortage of West Indian cotton next year. At the same time the demand for fine staple cotton in England is steadily growing stronger, owing to its employment for special purposes incident on the war. Consequently, abnormally high prices are likely to prevail. Under such conditions there may be more in cotton than in sugar, while from an Imperial point of view, West Indian cotton is obviously a most important product to produce since the mother country is dependent on these islands for its chief supply. Again cotton possesses an advantage over sugar in that it will stand indefinite storage, while the crop itself occupies the land for only half the time required by sugar-cane, which allows of the cultivation of provision crops, fitting in well with the policy of more locally produced food.

The general line of argument, then, which it is sought to bring forward is the need for giving attention to the present agricultural position as a whole, and the danger that lies in allowing one's outlook to be obscured by the boom in sugar. Manifestly the position of the sugar-cane planter to-day is an extremely good one, but he should remember that there are four prime factors to his prosperity—market, season, labour, and ships. It is the last two which are of fundamental importance at the present time.



MONTSERRAT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1915-16.

This report is longer than usual and contains a large amount of information that will be found especially useful locally, and interesting in other places. It indicates in a general way that within the last year or two, a broader outlook has been taken on the agricultural problems of the Presidency; this is shown by various lines of activity, more especially by the policy underlying some of the experimental work.

In regard to routine work, the distribution of plants from the nurseries was characterized by the larger number of sugar-cane cuttings sent out as well as by the increased quantity of onion seed. Both of these are significant: the high price of sugar has caused a very considerable expansion of sugar-cane cultivation in Montserrat, while the operations of the Onion Growers' Association have stimulated the planting of onions. The distribution of provision crop material for planting purposes was less than in the previous year, a matter to be noted owing to the importance of producing ground provisions in view of the increased cost of living.

Work in connexion with cotton selection has been continued; special attention has been given in connexion with introduced strains from St. Kitts and St. Vincent. It is recognized that the work of Mr. Robson, Curator of the Botanic and Experiment Station, in connexion with cotton, is of fundamental importance to the Presidency. Extracts from that part of the report devoted to cotton will appear in a future issue.

Information relating to lime cultivation has regard principally to the conditions unfavourable for the vigorous growth of these trees. Description is also given of the new experiment plot, and reports by the entomologist and mycologist of the Imperial Department of Agriculture on a visit to Montserrat are appended. It would appear that sheltered situations are necessary for the successful cultivation of limes in Montserrat.

Under the heading of Experimental Work with Minor Crops, information appears concerning bay oil, ground nuts, pine-apples, peas and beans, Indian corn, sweet potatoes, cassava and yams. Although these are minor crops, the results of the experimental work recorded are of great interest and importance, and indicate that agriculture in Montserrat is tending to become more diversified, thereby increasing the economic stability of the Presidency. Special reference may be made to the experiments with peas and beans, and with Indian corn. Experimental shipments of ground nuts and pine-apples have been made with interesting results; the distillation work with bay leaves has been continued.

The observations relating to insect and fungus pests and their control have regard principally to the cotton stainer problem. Concerning the control of leaf rust on ground nuts, Mr. Robson has shown that Bordeaux mixture is effective in controlling this disease.

In regard to progress in the industries, the report shows that the exports of cotton were somewhat below the average for the past three years, but the prices obtained were better than last year. As already indicated by the large increase in the distribution of cane cuttings, there was a large increase in the acreage planted in sugar-cane during the year. Interest appears to be well maintained in bay oil, papain, and in the cultivation of onions. In regard to the last named crop, the formation of an Onion Growers' Association was an event of interest and importance during the year under review. This Association, which is affiliated to the original Antigua one, appears to have made a promising start.

The report closes with some miscellaneous information concerning the extraction of alkaloids from the leaves of *Pilocarpus racemosus*, and some figures are given concerning the composition of the Rangpur lime. The meteorological observations indicate, amongst other things, that the year's rainfall was unusually high, the average for twenty-two stations being 65·76 inches, which is 18·39 inches above the average for the previous five years.

BOTANY IN THE TROPICS.

The following extract is taken from the Address of the President (Dr. A. B. Rendle, F.R.S.) of the Botanical Section of the British Association for the Advancement of Science, 1916. It is that part of the Address in which the speaker refers to botanical matters in the tropics, and will be read with interest by those associated with West Indian botanic stations. Dr. Rendle complains that provision for botanical research work is inadequate, and cites Jamaica as affording a case in point. While this is true in a general sense, it should be remembered that a considerable amount of botanical investigation is being done in Trinidad and British Guiana, in Ceylon and the Federated Malay States, while for pure systematic work, the Colonies have always relied upon Kew. Dr. Rendle says:—

If we are to make the best use of our resources, botanical research stations in different parts of the Empire, adequately equipped and under the charge of a capable trained botanist, are a prime necessity. We seem to have been singularly unfortunate, not to say stupid, in the management of some of our tropical stations and botanical establishments.

The island of Jamaica is one of the oldest of our tropical possessions. It is easy of access, has a remarkably rich and varied flora, a fine climate, and affords easy access to positions of widely differing altitude It is interesting to imagine what Germany would have made of it as a station for botanical work if she had occupied it for a few years. The most recent account of the flora which pretends to completeness is by Hans Sloane, whose work antedates the Linnaean era. A flora as complete as available material will allow is now in course of preparation in this country, but the more recent material on which it is based is due to American effort. Comparatively recently a mycologist has been appointed, but there is no government botanist to initiate botanical exploration or experimental work or to advise on matters of botanical interest. A botanical station ideal for experimental work in tropical botanical problems is a mere appendage of a Department of Agriculture, the director of which is a chemist.

A botanical station for research to be effective must be under the supervision of a well-trained botanist with administrative capacity, who must have at his disposal a well-equipped laboratory and ground for experimental work. He must not be expected to make his station pay its way by selling produce or distributing seedlings and the like; a botanical station is not a market-garden. The director will be ready to give help and advice on questions of a botanical nature arising locally, and he will be on the lookout for local problems which may afford items of botanical research to visiting students. Means must be adopted to attract the research student, aided, if necessary, by research scholarships from home. The station should have sufficient imperial support to avoid the hampering of its utility by local prejudice or ignorance. The permanent staff should include a mycologist and a skilled gardener.

The botanical station does not preclude the separate existence of an agricultural station, but the scope of each must be clearly defined, and under normal conditions the two would be mutually helpful. Nor should the botanical station be responsible for work of forestry, though forestry may supply problems of interest and importance for its consideration.

HOG-RAISING IN CUBA.

Cuba consumes more than £2 000 000 worth of pork and pork products per annum, but as yet there has been no sustained effort to raise pork for the local demand, or to establish a packing-house industry, although the country is in many respects ideal for raising hogs. There is an abundance of water, forage all the year round, an equable climate, and, in addition, the widespread distribution of the royal palm tree ensures a great quantity of the seeds, called 'palmiche', which fall at all seasons of the year and are greatly relished by swine. The palmiche gives the meat a nutty flavour that is very fine indeed, and pork raised on this food is held in great esteem. The animals thrive on it amazingly.

In addition to the palmiche there are other foods growing wild—the guava, which hogs relish, and yuca roots, and many other tubers and roots. Mango trees are distributed over the island, and in season, the ripe mangoes that fall are a considerable factor in the food supply. Sugar-cane is eaten with avidity, and is found to be remarkably satisfactory for putting flesh on hogs. Cow peas, peanuts, sweet potatoes, soya beans and the like as special forage and grazing crops grow with little attention. Good land suitable for hog-raising may be had for 10*s.* 6*d.* to £2 per acre, becoming more expensive as the location is nearer the cities.

The native hog in Cuba is very much like the famed, 'razorback' of the Southern pine woods—mostly head, legs, snout, and ears, swift of foot, but very hardy and thrifty, and does well without any care whatever. According to a report by the United States Special Agent in Cuba, there is as yet practically no effort to raise hogs commercially, except in small herds which range the woods in charge of a herdsman and his dogs. The meat of these semi-wild hogs is in considerable demand on account of its flavour from the palmiche seeds, but the supply is not dependable, and no attempt is made to put it up as hams, bacon, ribs, or sides. This fresh pork sells at $4\frac{1}{4}d.$ a lb. all the year round, and is scarce at times.

There has of late grown up in Cuba a sentiment in favour of producing more foodstuffs, and hog-raising is receiving considerable attention. The Cuban Agricultural Experiment Station at Santiago de las Vegas is experimenting with various breeds, and is in touch with the more progressive element which intends to devote attention to the growing of better pork. Cholera is known to some extent, but the most prevalent disease with which Cuban hogs are afflicted is called 'pintadillo', and is supposed to be a mild sort of cholera. The Cuban Experiment Station is now seeking in the United States a competent chemist to make cholera serum and to study the diseases of native hogs.

In 1913 Cuba imported 10,225 hogs, valued at £26,170, and in 1914, 9,816 hogs, valued at £26,920. The United States furnished the entire number. Duroc-Jerseys, Berkshires, and Poland-Chinas appear to be the favourites, and a cross between these and the native hogs produces a thrifty animal which, if not ideal in shape from the packing house stand-point, carries considerable meat, and is a great improvement on the native wild hog.

Some capitalists of the United States are now projecting a hog ranch and packing house on 20,000 acres of land in Pinar del Rio Province, about 60 miles from Habana. It is proposed to commence with a capital of £50,000. (*Journal of the Royal Society of Arts*, October 13, 1916.)

BARBADOS SUGAR-CANE EXPERIMENTS, 1914-16.

The report on the Barbados sugar-cane experiments for the season 1914-16 records further progress in regard to the establishment of seedling canes giving increased returns per acre. The weather, on the whole, was highly favourable for growth and arrowing, and a large number of new seedlings were raised. Much trouble, however, was occasioned, especially in the manurial experiment plots by root grubs; so extensive was the damage inflicted that it has prevented results of a reliable kind being made available.

The following are the comparative results obtained with the different seedlings cultivated by the Department during 1914-16:—

In the black soil districts, the average yield of the White Transparent from nineteen plots was 6,610 lb. of muscovado sugar* per acre. Of the varieties the seedling cane B.4578, which came first, gave a yield of 10,531 lb. of muscovado sugar, an increase of 3,921 lb. over the White Transparent, and an increased monetary gain of $141·55 per acre. It may however be mentioned that B.4578 was only grown on one plot at Hampton. W. No. 2 came next with 9,690 lb. of muscovado sugar, an increase of 3,080 lb., worth $111·19 per acre more than the White Transparent. Ba. 597 came third with a yield of 9,116 lb. of muscovado sugar, an increase of 2,506 lb. of the value of $91·47 per acre more than the White Transparent. B. 16832 gave a yield of 9,081 lb. of muscovado sugar, an increase of 2,471 lb., equal to an increased monetary gain of $89·20 per acre over the White Transparent. Ba.6032 came next with a yield of 8,938 lb. of muscovado sugar, an increase of 2,328 lb. per acre worth $84·04 more than the White Transparent. Three other varieties, B.12619, B.6308 and B.6835 gave yields of 8,744 lb., 8,670 lb., and 8,614 lb. of muscovado sugar, and a monetary gain of $77·04 $74·37 and $72·35 over the White Transparent. Ten other varieties mentioned in the table gave increased yields over the White Transparent of from 1,964 lb. to 176 lb. of muscovado sugar valued at from $70·90 to $6·35 per acre.

On the red soils, as will be seen from Table VIII, the average yield of the White Transparent as plant canes was 5,814 lb. of muscovado sugar per acre, while some of the better seedling canes gave much higher yields. For instance, the seedling cane B.6450 gave a yield of 8,793 lb. of muscovado sugar per acre, an increased return compared with the White Transparent of 2,979 lb., equal in value to $107·53 per acre. Ba. 6032 came next with 8,073 lb. of muscovado sugar per acre, an increase of 2,259 lb. of the value of $81·55. With Ba. 2471 the increase is 1,836 lb. of muscovado sugar per acre, of the value of $66·28. For B.3922 the increase is 1,692 lb., and for B. 376, 1,096 lb. of muscovado sugar, worth $61·08 and $39·56, respectively, per acre more than the White Transparent. Three other varieties, Ba. 3787, B. 6308, and B. 16832, gave increased yields valued at from $31·08 to $22·77 per acre more than the White Transparent.

On the red soils as plants, first and second ratoons, grown during the season under review, the White Transparent gave 15,760 lb. of muscovado sugar, worth at $3·61 per 100 lb., $568·94 for the three crops. B. 6450 gave 20,976 lb. of muscovado sugar, an increase of 5,216 lb., worth for the three crops $188·30 more than the White Transparent. B. 3922 came next with a yield of 19,286 lb. of muscovado sugar, an increase of 3,526 lb., worth $127·29 more than the White Transparent. With B. 16832 and B. 6308 the increases are 1,699 lb. and 1,393 lb. of muscovado sugar per acre over the White Transparent, worth respectively $61·33 and $50·28 for three crops. B. 376 and Ba. 3787 gave 670 lb. and 84 lb. more than the White Transparent, worth respectively $24·18 and $3·03 for the three crops.

Referring to Table X giving the average results of some of the better varieties for the past five years, it will be observed that on the black soils the White Transparent, which came out thirtieth amongst all the varieties cultivated in the black soils, gave an average yield of 4,920 lb. of muscovado sugar per acre on the average for the five years 1912-16. Ba. 6032, which heads the list, gave a yield of 7,728 lb. of muscovado sugar, an increase of 2,808 lb. per acre, worth at $2·41, the average price at which muscovado sold for that period, $67·67 more per acre per annum than the White Transparent. Ba. 5930 came next with a yield of 7,080 lb. of muscovado sugar per acre, worth $52·06 on the average for the five years more than the White Transparent. B. 12619 gave a yield of 6,920 lb. of muscovado sugar, an increase of 2,000 lb., worth $48·20 per acre per annum more than the White Transparent. Ba. 597, B.6308, and B.6450 gave increased yields of 1,780 lb., 1,581 lb., and 1,482 lb. of muscovado sugar worth respectively $42·90, $38·10, and $35·72 more per acre per annum than the White Transparent.

In the red soils, the White Transparent as plant canes for the five years gave an average of 5,321 lb. of muscovado sugar per acre. B. 6450, which heads the list, gave a yield of 7,791 lb. of muscovado sugar per acre, an increase of 2,470 lb. worth $59·53 more per acre per annum than the White Transparent. B. 3922 came next with a yield of 6,538 lb., an increase of 1,217 lb. of muscovado sugar, worth $29·33 per acre per annum more than the White Transparent.

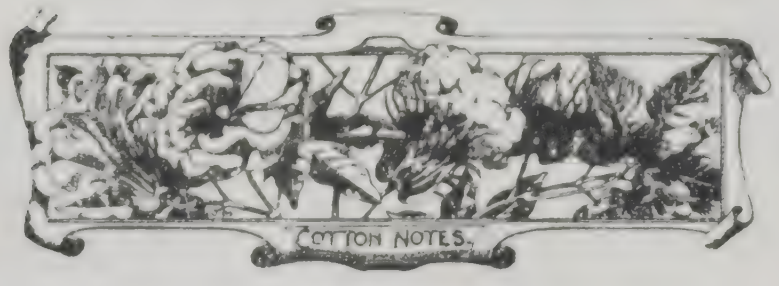
In order to see how the newer seedling canes actually in cultivation compare throughout the island with White Transparent, the standard cane, forms were sent out to a large number of estates and were returned with the necessary information.

In the black soil districts the mean average yields of the plant canes were as follows, viz., the B.6450 from 1,949·58 acres, 33·02 tons of canes per acre; the B.376 from 362·75 acres, 29·48 tons of canes per acre; the B.147 from 157·49 acres, 28·04 tons of canes per acre; and the White Transparent from 149·60 acres 27·71 tons of canes per acre, differences in yield over the White Transparent of 5·31, 1·77 and 0·33 tons per acre, respectively.

Attention is called to new seedlings worthy of being introduced into cultivation.

At the present time there are three seedlings which appear to be worthy of being tried under ordinary plantation conditions, we give the results obtained with them so that planters may, if they think fit, cultivate them tentatively on their estates. These varieties are—Ba. 6032, Ba. 7924, and B.H. 10 (12). Ba. 6032 has given, as the average for three seasons, from thirty-four plots, 1·429 lb. of saccharose per acre more than the B.6450, and 3,177 lb. of saccharose per acre more than the White Transparent; Ba. 7924 has given in the same fields, on the average for three seasons, 1,634 lb. of saccharose more than the B.6450, and 3,103 lb. per acre more than the White Transparent, while B.H. 10 (12) has given 3,496 lb. of saccharose more than B. 6450 and 5,422 lb. more than the White Transparent.

*100 lb. saccharose is taken as equal to 80 lb. of muscovado sugar with its molasses.



SEA ISLAND COTTON MARKET.

General Rise in Prices.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 14, 1916, with reference to the sales of West Indian Sea Island cotton:—

We have no business to report in West Indian Sea Island cotton, because there is no stock.

Sakellarides Egyptian has advanced rapidly, the highest sale having been at 27*d.* per lb.; all this is in favour of higher prices for West Indian when it arrives.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 11, 1916, is as follows:—

ISLANDS. The market has been active and advancing throughout the week; from 43c. our last quotation for Fine has advanced to 50c. All the offerings as shown on the market were readily taken, the sales being 140 bales, and there are further orders in the market seeking execution at the 50c., but with small receipts and limited offerings can buy only slowly at the price. This market is largely governed by the Savannah market, and should that market further advance this market would advance.

GEORGIAS AND FLORIDAS. The market has continued very active with advancing prices throughout the week, the buying being still on account of the Northern Mills and speculation, and closed strong, showing an advance of 6½c., with Factors holding at a further 1c. advance, which has been paid already in the interior markets. Notwithstanding this unexpected and almost unprecedented advance, there is still a disposition among the holders of cotton to keep their stocks off the market in expectation of still higher prices. This feeling is caused by the high prices ruling for Egyptians and the difficulty of getting them just now. The strength of the market is also due to spinners' orders seeking execution, and is not based on speculation or manipulation.

We quote, viz:—

GEORGIAS AND FLORIDAS.

Fancy and Extra Choice } at 49c. to 50c. = 50½c. to 51½c., landed.

with Factors holding 1c. higher.

The exports from Savannah for the week were, to Northern Mills, 2,461 bales, Southern Mills, 298 bales, and from Jacksonville to Northern Mills, 2,419 bales.

The United States Census Bureau reports cotton ginned to November 1, as follows:—

South Carolina	554 bales	making a total of 80,310 bales.
Georgia	53,294 ,,	
Florida	26,462 ,,	

Against last year	55,358	,,	total crop	85,278	bales
,, 1914	43,331	,,	,, ,,	78,857	,,
,, 1913	42,769	,,	,, ,,	85,544	,,
1912	28,655	,,	,, ,,	66,169	,,

EXTRACTION OF GROUND NUT OIL.

The interest that is being shown in the cultivation of ground nuts in some of the West Indian islands where cotton is grown makes it desirable to reproduce the following summary to *Farmer's Bulletin*, No. 751, United States Department of Agriculture. The important point is that West Indian cotton seed oil-expressing plants could be used for ground nuts if required:—

Peanut oil is one of the most important of the world's food oils.

The United States imported during the year ended June 30, 1914, 1,332,108 gallons of peanut oil, valued at $915,939.

In making high-grade edible oils in Europe the peanuts are cleaned, shelled, blanched, and degermed before being pressed. The first pressing is made without heating the material. After the first pressing the cake is reground and heated for the second pressing. Three pressings are usually made, and in some mills a fourth

In Europe the best grades of peanut oil are used for edible purposes. The second-grade oil is used largely in the manufacture of margarines.

Of the five varieties of peanuts grown in the United States, but one variety (the Spanish) should be grown for oil purposes.

In order to make a very high-grade edible oil the peanuts should be thoroughly cleaned, shelled, blanched, and degermed before being pressed.

When using a hydraulic press for expressing peanut oil the cleaned meats are ground and rolled in order to crush the oil cells. In the expeller type of machine the grinding is not necessary.

To make a high-grade peanut oil in a cotton-seed oil mill it will be necessary to install additional machinery. The equipment used in peanut cleaning and shelling factories could be used to advantage.

Experiments made in cotton seed-oil mills in this country show that the presses now in use can be used for making peanut oil.

The first pressing should be made cold, in order to get a high-grade edible oil which will not need refining. The second pressing should be made after regrinding and heating the cake from the first pressing. It is doubtful whether more than two pressings should be made in this country.

The oil from the first pressing should be a high-grade edible oil. The oil from the second pressing might be refined and used for cooking or for the manufacture of oleomargarine, or it might be used without refining for soap making.

The analyses of a large number of miscellaneous samples of Virginia and Spanish peanuts show a difference in favour of the latter of about 9 per cent. in oil content However, the analyses of the five varieties grown under the same conditions show very little difference in the percentage of oil.

Peanut meal, a valuable by-product of oil manufacture, is a highly nutritious stock feed.

Under present conditions oil mills can not afford to pay more than 70c. per bushel for peanuts to be used in making oil. Under normal conditions they could not afford to pay as much as this unless a higher grade oil is made than is being made at the present time.

The average cost of production of peanuts is $20 to $25 for a yield of 35 bushels per acre. At 70c. a bushel for the peanuts and $12 a ton for the hay, the gross returns would be $32·20.

At 70c. a bushel for Spanish peanuts the oil must sell for 60c. to 65c. per gallon in order to make a profit, figured on the basis of 80 gallons of oil per ton of peanuts.

Peanut oil and peanut meal should be correctly labelled and advertised for just what they are.

SPONGE CULTIVATION.

The method of cultivating sponges from cuttings, the success that has attended this cultivation in the shallow waters of Florida and the Turks Islands, and the desirability of making experiments in the Lesser Antilles are matters that were dealt with in some detail in the *West Indian Bulletin*, Vol. XV, No. 2 (1915), and more briefly in the *Agricultural News*, Vol. XIV, No. 356, p. 402. Since then efforts have been made to institute experiments in these islands, and the necessary official support required to effect the transportation of living material in the absence of ordinary shipping facilities and other difficulties has been secured, as well as suitable sites for planting the sponge.

When the idea first arose in definite shape, there was some feeling of uncertainty as to whether the tropical waters of the Lesser Antilles would furnish the exact environment required for sponges that flourish farther north. This still appears to be the only point of uncertainty remaining, for the cultivation of sponges from cuttings not only in Florida and in Turks Islands, but also more recently in the Bahamas, is proving itself to be an unqualified success and extremely remunerative.

According to the information which follows (extracted from a recent Colonial Report on the Bahamas), it is satisfactory to find that the rate of growth is more rapid in the warmer waters of the Bahamas than in the waters of Florida farther north, and also that the sponges maintain their high quality. This would lead one to suppose that at all events sponges would grow off the coral islands of the southern West Indies at least as well as they do in Florida, if not more rapidly. Hence one can regard the prospects of success in these waters as being extremely hopeful.

It will be noted, in the course of the following extracts, that the opinion is current in the Bahamas that experiments are already in progress in the West Indies—an impression derived no doubt from the constant references to the subject in this Journal. It is significant as regards final achievement of the aim in view, that the supposed general spread of the industry to these islands is viewed with alarm. As regards demand, however, statistics show that the market for sponges, partly on account of new uses and the partial dislocation of the Mediterranean trade, is strong enough to allow fresh competitors to enter the field without injury to those who are already in possession.

The information referred to consists chiefly in a portion of a special report by the Inspector of the Bahamas Marine Products Board. It is preceded by the following explanatory note concerning the Board's experiment at Little Exuma:—

'The farm at The Ferry, Little Exuma, has passed the experimental stage, as the Board has in its possession sponges of merchantable size that were grown from slips set out in March last (1915). These developed specimens are proof beyond dispute that sponge slips, planted correctly, will survive and produce perfect sponge. Another point of interest is that in our waters, growth is far more rapid than in the waters of Florida, our keenest rival in this new industry. In proof of this the Board quotes from the report of the inspector who visited the farm in February.'

EEXTRACT FROM INSPECTOR'S REPORT.

'On Wednesday I made a thorough inspection of the colonies of sponge planted in The Ferry waters. I found all the plants I examined in excellent condition. They apparently were in perfect health, and showed no signs of suppression or "stunt". I selected several specimens for exhibition, all planted in the present year (1915):—

1. From those planted on coral in March.
2. From those planted on discs by myself in May.
3. From those planted by the Commission in July.
4. From those planted in September.
5. Size when planted.

'The result of my inspection is so satisfactory that I can claim with assurance that sponge farming is an unqualified success, and that the Bahamas can easily make up the deficiency of wool sponge by that means. In three years at most medium sponge (the most merchantable size) can be produced, and the quantity will be limited only by the number planted. The rate of growth is far in excess of that laid down by the American biologist, Dr. Moore, who averages the increase at 8 inches per annum while the plant is under five years old. I have no scientific means of measurement, but from the cutting I have brought from the farm and the developed specimens, it will be readily seen that the increase is far in excess of the doctor's calculation.

'The Board also points out that sponge culture is spreading throughout the islands of the Lesser Antilles, and if this Colony is to maintain its place as the chief sponge market of the world, it is imperative to enlarge our cultivation and stimulate the production of sponge plants.

'The Board realizes that in their experimental operations the assistance of a biologist would prove a great benefit.'

Revenue of Dominica.—According to the *Dominica Chronicle* for November 22, 1916, the total revenue for the first quarter of the current financial year in Dominica was £11,848, being an increase of £573 over the revenue of the same period in the preceding year. The customs yielded £7,449, an increase of £1,055. The total expenditure was £9,957, a decrease of £1,300 as compared with the previous year.

Incense Trees in the West Indies.—In the *Perfumery and Essential Oil Record* for October 1916, appears some further notes on Elemi based upon information obtained from this Office. It appears that it is the resin of *Dacroydes hexandra*, which is the one commonly collected in the West Indies and used for incense and for torches. For the latter purpose, the incense is collected into masses on a stick, and held in place by wrappers formed of a leaf sheath of the cabbage palm. In an article in the *Kew Bulletin* for 1898, *Bursera gummifera* is referred to as the tree which yields West Indian resin, though it is pointed out that this species is probably not the only source of supply. According to these statements it would appear that there are two 'Gommier' or incense trees, the coast species being *Bursera gummifera*, L., and the mountain and inland species *Dacroydes hexandra*, Gr.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The need for giving greater attention to the increased cultivation of crops which can be consumed locally either as food or for manufacturing purposes in the West Indies is discussed editorially in this issue.

The recently issued report on the Botanic Station, Montserrat, is reviewed on page 403.

A newly published work on the Genus Phoradendron (mistletoes of the New World) is reviewed on page 413.

Under Insect Notes is given an account of recent field work connected with the control of pests of sugar-cane in British Guiana.

Agricultural Statistics of British India.

The agricultural statistics of India for 1914-15 are reproduced in the September issue of the *Tropical Agriculturist*, and some of these figures are of interest in view of the fact that they show the ratio between the area under food crops and the area under non-food crops in that country. In the journal mentioned it is not stated what the unit of area is to which the figures refer, but it may be taken as being acres. The point is that the total area under food crops is 215,194,000 acres compared with only 45,007,000 under non-food crops The area under rice amounts to 77,699,000 acres while 2,459,000 acres are under sugar-cane, most of the sugar from which is consumed locally. Incidentally these figures indicate the enormity of the Indian population which requires such a vast area of food-producing land to support them. In regard to the non-food crop areas by far the largest section is under cotton, namely, 15,222,000. Millions of acres are also devoted to jute, tobacco and fodder crops.

If one took a crop census in the West Indies, it would be found that the ratio between land under food crops and land under crops grown for export was exactly the reverse to that which exists in the case of India. It is probable in fact that the proportion of food-producing land bears an almost negligible ratio. This fact is significant in connexion with the ideas put forward in the editorial in the present issue.

Canadian Foodstuffs.

In connexion with the high price of food, the *Voice of St. Lucia* reproduces the following report from the *New York Times*:—

'The wheat crop of Canada for the present year will be only 159,123,000 bushels, as compared with 376,303,600 bushels in 1915, according to an official estimate issued to-day. The average yield per acre was estimated at 15 seven-eight bushels from a harvested area of 10,085,300 acres, as compared with 29 bushels from a harvested area of 12,986,400 acres in 1915.

'A marked decrease in the production of oats was also indicated by the estimated yield of 338,469,000 bushels from 9,795,000 acres, a yield per acre of 34·55 bushels, as against 45·76 bushels last year when the production was 520,103,000 bushels from a harvested area of 11,365,000.

'The barley crop was estimated at 32,299,000 bushels from 1,328,800 acres, or 24·31 bushels per acre. Last year's crop was 53,331,300, and the acreage 1,509,350.

'The probable production of rye was announced as 2,058,500 bushels from 101,420 acres, or an average yield per acre of 23·30 bushels as against a total production in 1915 of 2,394,100 bushels from an acreage of 112,300.'

If these figures are reliable, and there is independent reason to believe that there has been a general shortage in the Canadian cereal crops, partly due to the attack of a disease known as 'rust', then this provides an additional argument in support of the policy advocated to extend the area under substitutes for wheat in the West Indian islands.

Matte Tea Production in Southern Brazil.

An interesting article on the production of matté tea, which is a popular beverage in the southern States of South America, appears in the *Journal of the Royal Society of Arts*, for August 25, 1916. The matté tree grows to between 10 and 12 feet in height, and the leaves are said to resemble those of an English pear tree. The grades of matté depend upon the amount of wood in the leaf. This tea contains only half the amount of alkaloid which ordinary tea contains, and for this reason is said to possess two great advantages over either tea or coffee: It is less stimulating and very much cheaper. Matté is prepared in the same way as tea, and may be taken with sugar and milk. In powder it is prepared by infusion, putting it into a small vessel and pouring thereon a sufficient amount of boiling water. The trade in matté is very considerable in South America, the amount exported to the Argentine in 1913 being worth £1,793,800.

The United Empire.

United Empire (November 1916), the Royal Colonial Institute Journal, contains several articles of immediate interest to the West Indies, particularly one on Canada and the West Indies, by Mr. Evans Lewin. This puts forward views in favour of and against Canadian-West-Indian political union. It calls attention to an interesting tendency for the great dominions to gather extra-continental territories within their administrative fold. Specific reference is made to Australia and New Zealand, which of recent years have taken over the affairs of several Pacific islands. Without any great stretch of imagination, the article says, one may look forward to the time when the British Empire will consist of a number of self-governing communities, a series of empires within the empire, each responsible within the greater system for the administration of other territories, which will doubtless, in course of time, become equal partners within specific confederations.

Preservation of Natural Colour in Plants.

A method is described in *Nature* (November 9, 1916) for fixing the green colour in plants. This consists in placing the plant for a shorter or longer period in a boiling solution of copper acetate dissolved in acetic acid, a combination of the copper salt with the chlorophyl being formed which renders the colour permanent when the specimen is exposed to the light after drying or after placing in a preservative solution such as alcohol.

The article goes on to say that it is essentially a method, the results from which gain by experience; different plants lend themselves to the treatment with different degrees of success, and require very different periods of treatment; the time for which it is necessary to keep the plants in the boiling solution varies from one minute to forty minutes, according to the action of the copper salt upon the plant. After treatment the plants should be washed (like photographic prints) in running water for about two hours and then dried under light pressure.

A stock solution is made by saturating commercial strong acetic acid with powdered copper acetate. For treatment, dilute the stock solution with water in the proportion of 3 or 4 parts of water to 1 of stock solution. The solution is heated in a non-metallic vessel, glass beakers being probably the most suitable, and wooden, not metal, forceps should be used for manipulating the specimens.

At the British Natural History Museum this method has been used for some time past in the preparation of plants for exhibition purposes and good results have been obtained with cryptograms like ferns and algae, as well as with flowering plants.

The method described above may be found useful in some of the schools and museums in the West Indies.

Photographic Illustrations in Agricultural Science.

In glancing through the numberless periodicals which are now published in connexion with agriculture and the allied sciences one is struck by the great variation in the quality of the half-tone illustrations. In many cases there is much that is left to be desired, and the reason for this prevalent inferiority may be found to lie chiefly in the fact that agricultural subjects are not easy to photograph on account of the lack of contrast, the large amount of detail, the difficult colouring and the difficult perspective, which are so frequently found to prevail.

An article which should serve a helpful purpose in regard to these matters appears in the *Agricultural Journal of India* (Vol. XI, Part 3) and is entitled Photographic Illustrations, the author being Mr. C. M. Hutchinson, B.A., Imperial Agricultural Bacteriologist in India. This article, which is accompanied by many comparative illustrations, is most instructive. The first plate shows the advantage of using evening light where it is desired to bring out detail. Another plate shows the superiority of an ordinary over orthochromatic plate for subjects depending for proper delineation upon shadow contrast rather than colour differences. Two comparative photographs of butterflies show the necessity for the use of orthochromatic plates for such coloured objects. In this illustration, where the ordinary plate is used the orange-yellow colouring of the underwing of one of the butterflies fails to come out; the effect is seen to be obtained however by employing a Wratten M plate and yellow screen. There are many other similar illustrations in this article which should be read by all experiment station workers who are brought into contact with the question of photography.

INSECT NOTES.

PESTS OF SUGAR-CANE IN BRITISH GUIANA.

In the present and succeeding number of the *Agricultural News* it is proposed to give a review of the last two reports by Mr. H. W. B. Moore, Entomologist for a number of estates in British Guiana. These two reports cover the years 1914 and 1915. The report for 1912 was reviewed in the *Agricultural News* for August 16 and 30, 1913 (Vol. XII, pp. 266 and 282), while that for 1913 was taken up in the number for July 18,1914 (Vol. XIII, p. 234).

The reports for 1914 and 1915 are concerned entirely with the insect pests of the sugar-cane, and are not only of great interest as showing what can be done in the way of control by efficient organization and co-operation, but are of considerable value as records of the different pests with their parasites, predators and other natural enemies.

It is intended in the present article to confine attention to the small black hard back, which has only recently come into prominence as a pest in British Guiana.

THE SMALL BLACK HARD BACK (*Dyscinetus bidentatus*).

In 1914an outbreak of the small black hard back on young canes after the heavy rains brought this insect into immediate prominence on all the estates. but five of them suffered heavily. The adults, which do all the damage, attacked the young shoots in such numbers that all these were killed off as they sprouted, and in many cases the beetles bored in and destroyed everything from which fresh shoots could grow. Experiments were undertaken in the worst infested fields to dertemine the amount of infestation, and these experiments showed that the small black hard back alone was responsible for about 75 per cent. of the dead hearts, while the smaller moth borers accounted for the remaining 25 per cent. This infestation continued on all the estates until well into August, while in December there was another outbreak, but the damage was only slight, perhaps because the rains were not heavy.

Two attacks occurred in 1915, the first in January at two estates over small areas, severe on one estate and slight on the other. The second attack lasted from about April to the end of July and was felt on several estates, although slightly in most cases. On the three estates most severely infested a grand total of over 210,000 grubs was collected. These numbers, however, are very small compared with the severity of the infestation, but show that the beetles are not very easily collected or trapped, and that very likely one beetle was responsible for more than one dead heart.

Mr. Moore in his 1914 report gives some interesting details of the life-history and habits of this beetle. The milk-white, nearly globular eggs are laid singly and loosely in the earth about the cane stools at a depth of about 1 to 5 inches below the surface, and several may be deposited at a stool. Eggs collected on June 23, and probably laid some days before, were hatching on the 29th and 30th.

The newly hatched larva is white, with red mandibles and short reddish hair, while the adult larva is dirty white with the posterior end dark brown to almost black, due to the accumulated excrementitious matter within. The segments are wrinkled and clothed with short reddish hair, while the head is yellow. The pupa is formed in an earthern cell.

Mr. Moore considers that under favourable conditions the larval period would be about two months, but this period may be considerably lengthened by bad feeding or by dry weather

The pupal period is probably about a month, so that under suitable conditions the time from egg-laying to adult can be a little over three months. This was shown by the fact that larvae hatching about the middle of July emerged as adults on October 12. (The eggs in this case must have been laid early in July.) These beetles kept alive without food for a month, and under natural conditions would have remained underground until the end-year wet season. It would appear, therefore, that eggs deposited at the mid-year rainy season develop into adults in time to emerge at the end-year rainy season; also that eggs laid at the end-year wet season develop into active beetles by the time of the mid-year rains.

The larvae live in the earth about the cane stools, feeding almost entirely on soil containing decayed vegetable matter. Thus they do not appear to be harmful, but must be destroyed before they can develop into destructive adults.

The beetles are active at night, but hide in the daytime in the earth about the stools, or in a hole they make at the base of the young shoots.

It is stated in the 1914 report that two things are essential for the growth and development of the small black hard back, namely, (1) an abundant and long-continued supply of moisture, and (2) decaying vegetable matter. Eggs left without moisture soon shrivel up, while young larvae deprived of moistened vegetable food quickly perish, and older larvae may survive for months with practically no growth at all. But where the larvae find the cane stools decayed or in a poor condition, and the moisture conditions suitable, they are almost certain to cause serious damage to the crop. The larvae of the large moth borer (*Castnia licus*) is primarily the cause of the bad state of the cane stools, but poor or unsuitable soil and bad weather are also responsible.

Following on the decaying of the stools come a number of scavengers, which besides the grub of the small black hard back include weevil borer larvae, stool moth larvae (*Acrolophus sacchari*), root scale (*Aspidiotus sacchari*), wood ants, millipede earthworms, wood lice, and small molluscs. The best protection against the attack of the small black hard back lies in a healthy, vigorous condition of the cane stools. To induce this healthy condition Mr. Moore recommends control of stool-eating insects, such as Castnia, and more frequent replanting, since ratoons suffer most from the pest. Also digging out of dead stools is an important measure of control, since in this way not only can the grubs be collected in large numbers, but the forked up stools soon dry on exposure to wind and sun, so that numbers of eggs are deprived of the necessary moisture, and both eggs and grubs are exposed to their predaceous enemies.

Furthermore, replants should not be made on lands previously occupied by such grasses as arrow grass (*Anatherum bicorne*), or razor-grass, the shoots of which are attacked by the hard back in the same way as are those of the sugar-cane.

Trap-lights were suggested at first, but it was not considered that these would be a success, as the adult beetles are rarely found at lights in houses. The use of trap-lights was thoroughly tried out in 1915, but proved a failure.

The experiment of sending boys to hunt for the beetles at night with lanterns (as was done in Mauritius with *Phytalus smithi*) was tried in 1915, but abandoned as giving poor results.

It is further recommended that a portion of the mid-year grindings be drawn up to February or early March, and the remaining portion left over to late June or July. In the former case (February and March being usually dry) the canes would be all too high for serious attack by the beetles

when the May rains come on, and in the latter case the August dry weather would soon put an end to their activity.

HARD BACK ENEMIES.

In 1914 Mr. Moore found a parasitic grub feeding on a hard back grub. The adult parasite turned out to be *Tiphia parallela*, the same species of Scoliid wasp which is believed to control the brown hard back (*Phytalus smithi*) in Barbados.

In 1915 numerous cocoons of this same wasp were found in one of the fields at Non Pareil estate in the earth about the cane stools. The parasites had nearly all emerged. Parasitic eggs and larvae were also found attached to hard back grubs. *Dielis dorsata*, another Scoliid wasp, was occasionally observed in cane fields, but which particular hard back it parasitizes has not been determined. Kop-kop ants were noticed feeding on the grubs of the small black hard back.

J.C.H.

UNITED STATES DEPARTMENT OF AGRICULTURE.

The editorial in a recent issue of the *Experiment Station Record* states that an Act has recently been passed which considerably extends and enlargens the functions and activities of the United States Department of Agriculture, and establishes a new high-water-mark in the appropriations for its maintenance. Some of the more interesting directions in which more money is to be spent may be referred to in this note since they are not devoid of signifiance with regard to the West Indies. It may not be out of place also to make definite acknowledgement of the great value to the West Indies of much of the literature issued by the United States Department of Agriculture, though perhaps this is unnecessary in view of the large amount of space devoted to American information in this Journal. In regard to the special subject under consideration, the Weather Bureau is to receive an increase of $81,210, of which $40,000 is for the extension of the weather service to the Caribbean Sea Region, the Panama Canal Zone, and Alaska. The total appropriation to the Weather Bureau is $1,747,260. In regard to the Bureau of Animal Industry, it is interesting to note that a special appropriation of $60,000 is continued for the work in live stock production in the cane sugar and cotton districts, now being conducted in close co-operation with the State of Louisiana. Altogether the grant allotted to the Bureau of Animal Industry amounts to $3,020,746. The Bureau of Plant Industry receives an increase from $2,139,150 to $2,537,120, its appropriations being divided as usual among the large number of projects. The total appropriation for the States Relations Service is $2,969,680, as compared with $2,821,840 for the previous year. The main item of increase is one of $100,000 for the Farmers' Co-operative Demonstration Work outside of the cotton belt. It is stated that this would permit of considerable further extension of that work, and of initiating in a small way extension work by women county agents. There is also an increase of $23,000 for the experiment stations in Alaska, Hawaii, and Porto Rico.

In Ceylon, similar trials have been made with Ajowan seed to those carried out in the West Indies. The *Tropical Agriculturist* for October 1916 states that the plants grew freely and were of two kinds, yellow and white, the seeds of which were collected separately for further sowing. The seed of the white variety yielded on distillation 2·2 per cent. of oil, containing 60 per cent. of thymol.

AGRICULTURE IN NEVIS.

The Agricultural Instructor in Nevis has forwarded to this Office a copy of the report on the work of the Experiment Station and on the condition of staple crops in the island during the quarter ended September 30, 1916.

It would appear that the condition of the crops in the demonstration plots at the Station, namely, cotton, Indian corn, and onions is all that could be desired. The small plots of Para peas and Lima beans have not, however, done so well.

The cane crop throughout the island was looking very promising at the end of the quarter, and good returns are anticipated. A large acreage is under cultivation by peasants, who have turned their attention to sugar-cane on account of the high price for sugar.

The cotton crop throughout the island has improved somewhat and picking has begun in several places, but the returns will probably be below the average. The peasants have not planted as much land as usual, chiefly on account of the bad weather at planting time, and the high price for sugar.

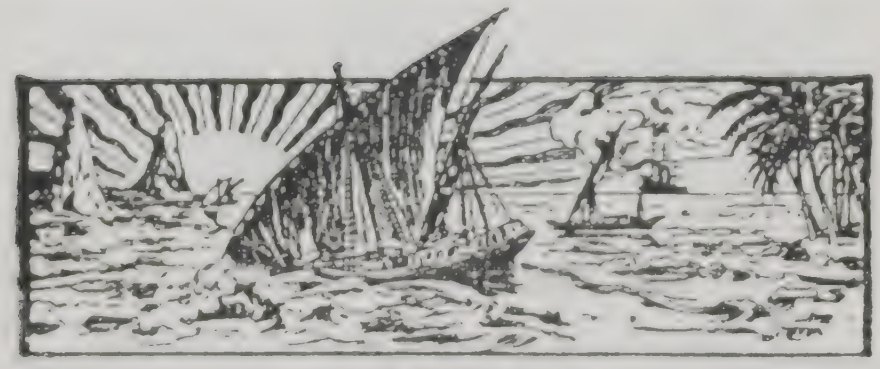
The provision crops were looking somewhat better. A large acreage was planted in sweet potatoes and cassava; plots of peas, beans, and Indian corn have also been planted.

Eighty-three pounds of onion seed was imported through the Imperial Department of Agriculture, and distributed to growers about the island. The germination on the whole was excellent, and the field plots had all been carefully prepared.

Several meetings were held during the quarter. A meeting of the planters was held on September 14, at which an address dealing chiefly with the sugar industry was delivered by Dr. Watts. Several meetings in regard to a proposed central sugar factory for Nevis were held during the latter part of the quarter. The first meeting of the Nevis Onion Growers' Association was held on September 20.

The agricultural position in Nevis, therefore, would appear to be in a very satisfactory condition, and with a continuation of favourable weather good crops may be expected.

The Rise of Plantation Rubber.—The insistence of the war-demand has helped Plantation rubber in its rivalry with Fine Hard Para. It is stated in *Colonial Reports—Annual*, No. 905, on the Straits Settlements for 1915, that manufacturers have been compelled to lay aside their aversion to trying Plantation and appear to be satisfied with the result of that trial. At the beginning of 1915, Fine Hard Para stood, as it had done persistently for the preceding eighteen months, at a considerable premium above Plantation. Early in the year the two rivals drew level, and now Plantation is leading though the lead is small. It is added that the establishment of a rubber market in Singapore and Penang has also helped Plantation rubber, large forward contracts being now practicable.



GLEANINGS.

The *Journal of the Jamaica Agricultural Society* calls attention to the fact that the recent reports of the Department of Agriculture show that the extensive supply of cacao seedlings for planting up estates is being well maintained. At Hope in 1914-15 only 7,591 plants were sent out, but in 1915-16 there were 20,024 cacao plants distributed. Altogether the department distributed 127,652 of these plants.

According to the *Louisiana Planter* for November 4, 1916, the principal variety of sugar-cane now grown in Louisiana is D.74. Out of several hundred varieties that have been tried, D.74 and D.95 have proved most suited to Louisiana conditions owing to the fact that they have the highest saccharine content coupled with that comparative early maturity that is essential for sugar-cane in Louisiana.

At a meeting held in Trinidad recently it was strongly urged that the Government should help to establish a co-operative lime juice factory on similar lines to that which is working successfully in St. Lucia. It appears that the cultivation of limes is making distinct progress in Trinidad and that at a not very distant date its exports will be considerable. Those interested in lime cultivation in Trinidad should read a paper on the subject published in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for October 1916.

The Agricultural Superintendent, St. Lucia, writes to say that the following agricultural produce was shipped from that island by the S.S. 'Sargasso' on November 16: concentrated lime juice, 97 casks; lime oil, 35 carboys and cases; cacao, 628 bags; sugar, 850 bags; and kola, 19 bags. This included 15 casks of concentrated lime juice and 12 carboys of lime oil from the Government lime juice factory, bringing the total shipment for the year to date up to 66 casks of concentrated lime juice and 12 carboys of distilled lime oil.

The methods of preparing the land for corn culture in the south-eastern United States is described in *Farmer's Bulletin*, No. 729, United States Department of Agriculture. It is stated that on warm, well-drained land, corn in furrows has the advantage over that planted by other methods, because its growth may be better controlled, serious injury to the roots in cultivating is avoided, and weeds and grass are more easily combated. Methods of preparing furrows and planting in them are described, and special attention is called to the desirability of using the lister.

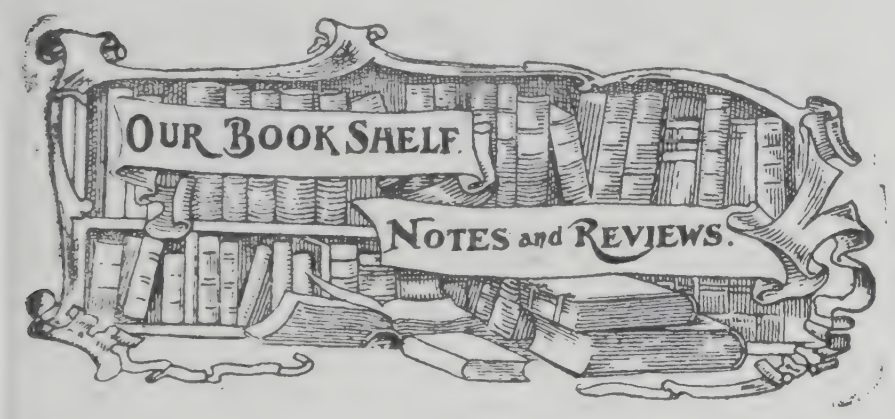
An account of the present position of the marine industries of the Bahamas is given in *Colonial Reports—Annual*, No. 900, 1915-16. It appears from this that the cause for the diminution in the supply of current sponge is due to the deficiency of shell. Each of these particular sponges has a shell as a base upon which it is attached and growing, and it follows that an abundance of shell in the current means an abundant crop of current sponge. The distribution of shells throughout the current ledge is advocated together with the prevention of the practice of carrying off both sponge and shell by the sponger.

In the *Experiment Station Record* for September 1916 a note appears on studies on alkaloid formation in plants. They were carried out with different varieties of tobacco and show that there is no clear and constant relation between the richness of the fertilizer used and the nicotin content of the resulting plant, but they do show an increase of nicotin with the age and growth of the plant. The total nitrogen varied during growth according to the variety of plants and the situation of the leaves tested. In the less strongly manured plant, the total protein nitrogen decreased with their age. In the more heavily manured, the content was greater.

A copy has been received of the report on the Botanic Station, British Honduras, for the year 1915. This, as usual, deals merely with work carried on at the Botanic Station. It is noticed that a fine lot of new seedling canes raised from canes imported from British Guiana were raised for distribution, indicating that in this colony also the area under sugar-cane is undergoing extension. There was also distributed from the Station a large number of coco-nut and cacao plants. Unlike the other products, the export of coco-nuts increased during the year 1915, being roughly 7½ million as against less than 6½ million, the average for the previous three years.

An interesting account of the Jamaica hurricane of August 15 to 16, 1916, has been prepared by the Government Meteorologist of that Colony. It appears that the first warnings from Washington placed the centre too far away to the south-east and that the storm came more or less as a surprise to the island. The report contains full observations made at various stations, and the writer uses these to formulate certain conclusions as to conditions which obtained. He employs a formula for determining the velocity of the cyclonic winds by the fall in the barometer below the mean, and there are several other similar points in the report which will prove of interest to those who are concerned with the study of storms.

In reply to a letter concerning assistance in the matter of supplying Tortola with planting material rendered urgent by the recent hurricane, His Honour the Adminstrator of St. Lucia informs this Office that owing to the scarcity of ground provisions locally, the Agricultural Superintendent has only found it possible to forward 1½ gallons of cowpeas to that island. His Honour adds, however, that the Legislative Council has voted £200 for the relief of the sufferers. In this connexion it may be added that a relief fund has been started in Barbados and a considerable sum of money has been collected, some of which has been expended locally on lumber which is urgently needed for the reconstruction of houses in Tortola. The Government of Barbados has voted £100 for this purpose.



THE GENUS PHORADENDRON: A Monographic Revision. By William Trelease. *University of Illinois, 1916.* Pp. 1-224, pl. 1-245.

The genus Phoradendron is composed of the species of mistletoe occurring in the New World which are of interest to agriculturists principally in respect of their parasitic relations to certain cultivated trees. The genus extends from as far north as Washington to as far south as the mouth of the La Plata, and it is represented through the entire West Indian chain. It is stated that the greater number of tropical species differ from those of the north in being androgynous through the occurrence of a number of staminate flowers on spike points that are otherwise pistillate. The number of species recorded in the different British West Indian islands is as follows:—

Antigua,	2.
Dominica,	5.
Grenada,	3.
Jamaica,	12.
Montserrat,	1.
St. Vincent,	5.
Tobago,	1.
Trinidad,	6.

For the convenience of botanists we reproduce the following notice of the work, by O. Stapf. (*Kew Bulletin*, No. 9 of 1916):—

'The genus *Phoradendron* in the New World takes the place of *Viscum* in the Old. Most species so resemble the common mistletoe as to be mistaken for it in a winter landscape; but beneath that great general resemblance is hidden a remarkable differentiation of minor characters often difficult for the inexperienced eye to grasp, but mostly going hand in hand with a definite and frequently narrow geographical distribution. On it is based the author's admission of a great number of species, 240 in all. The number may appear excessive, but the careful scrutiny which he has applied to his subject and the concordance of his work and the results obtained by the most careful students in the same field before him, as Eichler and Urban, impress one with confidence in the soundness of his limitation of the species. A passage from his introduction (p. 17) may be quoted as characteristic of the stand-point of the author in that respect: "In a monographic assemblage, such as is here offered, no lasting harm can come from the most radical segregation of forms possible on morphologic and geographic considerations, while on the other hand a blending of widely dissociated forms or of such as differ greatly in their extremes though without as yet definable breaks in the series, e.g. *P. piperoides*, leaves the work to be taken up once more from the very foundation, and with reference to all of the original materials that may have survived."

'The introduction (pp. 3-17) gives a short historical summary which implicitly settles the question of the validity of the generic name, an analysis of characters, brief notes on the parasitism, the host and enemies of *Phoradendron*, the orgin of the genus—it is regarded as probably of late Tertiary origin in the New World to which it is confined—and the range of species, the area of the genus as a whole extending from Washington, Southern Colorado, the mouth of the Ohio and Southern New Jersey to the La Plata in the South. The text, including the description of new species, is in English. The figures cover 237, or nine-tenths of the recognized forms, a very unusual degree of completeness of illustration. They are all reproductions of photographs of natural size, and where possible from type specimens. They will be of great help but they also emphasize the limitations of this process of illustration. Many of the figures are no better than outline reproductions with all detail lost or blurred. The indices of collectors and of occurrence are very full and should be very useful.

'The genus is divided into two primary divisions, namely, Boreales and Aequatoriales, which, apart from their geographical areas, are characterized by the absence or presence respectively of cataphyllary scales. Each of these divisions is divided again into sub-divisions and some of them again into minor groups. All the sub-divisions and minor groups as well as the species are conveniently keyed. Under each species we find a complete account of the synonomy, a description, general indication of distribution, and a complete list of the specimens examined.'

Electricity and Plant Growth—Evidence is accumulating that plants subjected to high tension electricity by means of overhead wires respond by increased vigour and yield. Thus in the experiments carried out by Miss E. C. Dudgeon in 1915 near Dumfries, oats grown on electrified and non-electrified areas each of 1½ acres showed a marked response to electrification. The yield of grain in pounds from the electrified area was 1,309, as against 1,003 from the non-electrified control—an increase of grain of 30 per cent. The yield of straw was even more markedly in favour of the electrified plot: 2,476lb., as compared with 1,572lb., an increase of 58 per cent. We believe that similar and even more decisive results have been obtained at Dumfries this year, and that electrification again resulted in large increases both of grain and straw. On the contrary, as those who have visited the R.H.S. Gardens at Wisley may have observed, similar experiments which have been carried out by the R.H.S., in conjunction with the Imperial College of Science, have not so far yielded results in favour of electrification. We are informed, however, that these experiments are to be continued during the coming year. If they result in increases of yield of horticultural plants as large as those which appear to be consistently obtained with oats, we may yet live to see the overhead electric discharge in operation as an adjunct to intensive cultivation. The cost of the current used is but small, although that of the initial installation is by no means inconsiderable. Where cheap current is available, however, the method, if it prove to have a pronounced and positive effect on the crops, should have a bright future before it. (*Gardener's Chronicle*, November 11, 1916.)

According to information received from the Curator of the Botanic Gardens, Dominica, the distribution of plants from the nurseries during November consisted of the following: limes, 9,250; shade trees, 430; budded citrus, 272; cacao, 25; grafted mangoes, 7; miscellaneous, 36. This made a total of 10,020.

PLANT DISEASES.

AFFECTIONS OF LIME SEEDLINGS.

Mr. W. Robson, Curator, Montserrat, recently forwarded for examination specimens of lime seedlings attacked by a fungus in a manner different from that of the damping-off fungus familiar in citrus seed beds. In this case the disease affects the tips of young plants 2 or 3 inches high. One or two of the youngest expanded leaves suddenly turn yellow over a part or the whole of their surface, and the growing point is infested and killed.

A small amount of loose, white mycelium develops externally on the affected parts, and the tissues are found to be infested with freely branching hyphae, coarse and irregular, and of gorged appearance.

The fungus is one of the downy mildews (Peronosporaceae). The few sporangia seen were more or less detached, and the genus could not be ascertained. The nature of the disease is characteristic of this group, especially of the genus Phytophthora, to which this fungus most probably belongs.

The seedlings in question occurred in two beds which for part of the day are shaded by the surrounding trees, and on the most shaded parts all the seedlings have died. The appearance of the disease is to be accounted for by these conditions of damp and shade, accentuated by the abnormally heavy rains which fell during the period in which the affection came to notice. It does not seem probable that any direct measures of control will become necessary.

The damping-off disease of lime seedlings referred to in the first paragraph above, which is a more or less regular feature of nursery work in Dominica and St. Lucia, has caused inconvenient losses this year at Réunion in the latter island, owing to the unfortunate occurrence of heavy rains after the successive sowings. Mr. A. J. Brookes, Agricultural Superintendent, in response to a request for information as to the incidence of the affection, forwarded the following notes.

'Provided few showers fall between the time the seeds germinate up to the time they are about 4 inches in height, large batches can be successfully raised without the fungus appearing.

'To produce sufficient seedlings to raise 70,000 strong plants we have to sow in batches for the necessary succession, and we invariably get hit by the fungus in the batch which should be ready for planting in July and August. If we get heavy rain on certain days with hot dry intervals of a few days between we are still all right, but if a light shower falls on each day for three days in succession, the fungus rapidly attacks over the whole area at the same time.

'This year we had a very bad season, rain falling about two weeks too soon for the safety of the seedlings, and the successive sowings, made every week so as to strike a dry spell sooner or later, were attacked, and heavy dustings daily and sometimes twice daily with sulphur and lime had to be made to keep the disease in control. This remedy is very effective if the rains are not continuous.

'Once the seedlings become woody they are safe. This stage is reached when they are about 3 or 4 inches in height.'

The fungus concerned has not been identified owing to failure so far in obtaining it in a fruiting condition. The specimens examined have hyphae which are freely septate, and the disease has no relation to that from Montserrat described above.

A DISEASE OF ALFALFA.

Mr. Robson forwarded in August specimens of diseased alfalfa grown in Montserrat from seed of the Grimm variety obtained from St. Croix. At the time of writing the plants were from 1 foot to 18 inches in height, and were flowering. They did not promise to be of any more vigorous a type than those tried many years ago, the cultivation of which was abandoned.

The lesions found in the large supply of spirit material examined have constant characters. They occur as black spots encircling the stems just above the crown for a distance of about half an inch. The cortex at this place becomes infested with stout, freely septate, much branched hyphae, which mostly follow a longitudinal course. The cortex is rotted off down to the woody cylinder, which is externally discoloured but not, so far as was seen, much invaded. Above the lesion a thick cushion of callus commonly forms, which may send out abundant adventitious roots, showing that the fungus is probably limited in its action to the neighbourhood of the surface of the soil. The roots do not seem to be at all affected.

No trace of fruitifications could be found, nor any evidence indicating the systematic position of the fungus. The evidence seemed to exclude insect complicity in the formation of the lesions.

THE SMALL ROSELLINIA ON CACAO.

A description is given in the current number of the *West Indian Bulletin* (Vol. XVI, No. 1) of an unidentified species (referred to as C) of Rosellinia found on cacao in Grenada and St. Vincent and on immortel in St. Lucia. A letter from the Director of the Royal Botanic Gardens, Kew, has now been received enclosing a memorandum by Miss E. M. Wakefield discussing the identity of this fungus. It is stated that the species does not agree with any one of which material exists at Kew, and consequently all the published descriptions have been carefully compared. The only known species to which it can be referred with any probability from the description only, is *R. paraguayensis*, Starb., which was described from San Tomas, Paraguay, in 1904. With this it agrees fairly well. There are a few minor points of difference, which may however be merely individual variations. On the whole, the agreement is so close that without having seen material of *R. paraguayensis* it would be unsafe to regard the West Indian form as distinct.

In view of this information it would seem that, pending a comparison of actual specimens should that become possible, the name may be adopted for purposes of reference to this fungus in departmental communications.

W.N.

The paper dealing with sulphur on alkali soils appearing in *Soil Science* for September 1916 is of interest in regard to 'gall patches' on the soils of Antigua. It is suggested in this paper that sulphur might be used to reclaim alkali soils instead of sulphuric acid previously proposed. There are vast areas of land in which carbonates and bicarbonates of sodium are present in sufficient amount to interfere partially or completely with profitable crop production. It is hoped that experiments will be undertaken with sulphur as a means of reclaiming land which now contains an excess of these carbonates and bicarbonates.

NEW RESULTS IN THE INVESTIGATION OF RUBBER.

An important paper appears in the *Agricultural Bulletin of the Federated Malay States* for July 1916, describing the latest results in the investigation of the question of lack of uniformity in Plantation rubber. Most of this work has been conducted by the Department of Agriculture of the Federated Malay States, where recently an experimental vulcanizing factory has been established.

The quality in Plantation rubber which is most liable to variation is the speed of vulcanization (rate of cure). Readers will probably be aware that vulcanization consists in the combination of rubber and sulphur, and is governed principally by three factors—temperature, period of curing, and proportion of mixture. In rubber experiments it has been usual to work with a constant proportion of sulphur, and a constant temperature. If different Plantation rubbers are treated for the same period, it appears that they are not vulcanized to the same degree: one is under vulcanized, very elastic but not strong; another well vulcanized, very elastic and strong; a third perhaps over vulcanized, not very elastic, and brittle.

This difference in quality is naturally very trying to the manufacturer, and has bred a certain amount of distrust in Plantation rubber.

Experiments conducted in the Federated Malay States have shown where these differences in vulcanizability lie. It was previously known that there is some connexion between the albumen in rubber and vulcanizability. It was also known that certain nitrogenous chemicals could serve to hasten vulcanization, and in the last few years a great number of such material also have been patented as aids to rapid vulcanization. But the connexion between these facts, the difference in vulcanizing properties of Plantation rubber, and present day methods of preparation, have only recently been traced. Investigation in the Federated Malay States has shown that it is not the actual albumen which affects the rate of cure, but the products of its decomposition. It has been proved that these natural decomposition products have the property of acting as accelerators of vulcanization. Also under usual methods of preparation these products occur in quantities differing sufficiently to cause differences in vulcanization. In one of the experiments allowing rubber to stand exposed for a longer time than usual, the time of vulcanization was reduced from three hours to one and a quarter to one and a half hours—a large difference.

When rubber is treated chemically so as to get rid of the albuminous matter and the products of its decomposition, it has a vulcanization period of six hours instead of three. Further, rendering the rubber alkaline and keeping it for ten days reduces the period of vulcanization to the rapid time of half an hour. The effect of the alkaline is known to be specifically chemical and not biological as was at first thought.

The above facts are sufficient to give some idea of the important results that have recently been obtained in the East. They have not only shown the previously unknown cause of the differences in vulcanizability of Plantation rubber, but have at the same time shown how to prepare rubber of rapid or slow vulcanizability at will.

As to the various factors in preparation that lead to lack of uniformity may be mentioned the age of the trees, climate, the soil, methods of tapping—all of which may have an influence on the composition of the latex and its proportion of albuminous matter. The lapse of time between tapping and coagulating may exercise a great influence, a prolonged period tending to aid rapid vulcanization. The dilution of the latex at the time of coagulation, and the amount of acetic acid will also tend to affect the time required for vulcanization. The additon of anti-coagulants such as formalin and sodium sulphite tends to prolong vulcanization. The interval between coagulation and rolling is an important point, for it is during this period that the coagulation products are chiefly formed. Rolling may be of great importance. The thinner the crêpe, the more serum pressed out of it, the more difficult the rubber will be to vulcanize. Drying and smoking may also be of great consequence. Rapid drying hinders the formation of the vulcanization adjuncts. This has been proved definitely in the case of crêpe, and in the case of sheet also, which is smoked. Smoking or disinfecting tends to delay vulcanization. It is interesting to note that Para rubber vulcanizes relatively slowly. On the contrary, rubber obtained by ordinary smoking vulcanizes quickly. It is thus desirable to examine the various constituents of the serum which cause this different behaviour.

Many other experiments, besides those described in the first part of this article, have taken the problem of variability in Plantation rubber from the realm of hypothesis to the world of facts, and have shown us definitely that one of the factors causing acceleration in rate of cure is a decomposition product of the protein. It has also been found that another factor present in the latex itself is also involved, and this factor has been the cause of many anomalies which are now being cleared up.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados by the C.R.M.S. 'Caraquet' on December 13, after a visit to Trinidad extending over a fortnight.

According to *Colonial Reports—Annual*, No. 894, dealing with the Gold Coast in 1915, it appears that there is widespread destruction wrought by insect and fungoid parasites amongst the cacao gardens of this Colony due to neglect of the simplest sanitation and cultural work. Coercive measures are advocated for adoption such as are in vogue in towns for the regulation of buildings and the preservation of health. Generally speaking, the only work done in the cacao garden of the Gold Coast is that of cleaning the bush in order to harvest the crop. The carelessness of the native farmer is encouraged by the want of discrimination shown by the local buyer, who still makes little or no difference in the price he pays for cacao whatever the quality. The production of cacao has continued to increase, however, the exports for 1915 being greater by 46 per cent. than those for 1914.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 19, 1916.

ARROWROOT—$2\frac{15}{16}d.$ to $4\frac{1}{2}d.$
BALATA—Sheet, 3/3 to 3/6; block, 2/3½ to 2/4.
BEESWAX—No quotations.
CACAO—Trinidad, 84/- to 85/-; Grenada, 80/; Jamaica, 81/--
COFFEE—Jamaica, no quotations.
COPRA—£34 to £34 10*s*.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14*d*. to 21*d*.
FRUIT—Bananas, £17 per ton; Oranges, Jamaica, 15/- to 17/- per case.
FUSTIC—No quotations.
GINGER—Jamaica, 85/- to 110/-.
ISINGLASS—No quotations.
HONEY—Jamaica, no quotations.
LIME JUICE—Raw, no quotations; concentrated, £22; Otto of limes (hand-pressed), 10/- to 11/-.
LOGWOOD—No quotations.
MACE—$6\frac{1}{2}d.$ to 2*s*. 10*d*.
NUTMEGS—No quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, 3*s*. 3*d*.; fine soft, 3/-; Castilloa, no quotations.
RUM—Jamaica, 3/11 to 5/7.

New York.—Messrs. GILLESPIE BROS. & Co., November 14, 1916.

CACAO—Caracas, 15¼c. to 16c.; Grenada, 15c. to 15¼c.; Trinidad, 15½c. to 15¾c.; Jamaica, 11¾c. to 12¾c.
COCO-NUTS—Jamaica and Trinidad selects, $42·00 to $43·00; culls, $20·00 to $22·00.
COFFEE—Jamaica, 9½c. to 11½c. per ℔.
GINGER—14½c. to 17½c. per ℔.
GOAT SKINS—Jamaica, 70c.; Antigua and Barbados, 68c. to 70c.; St. Thomas and St. Kitts, 50c. to 68c. per ℔.
GRAPE FRUIT—Jamaica, $2·50 to $3·00.
LIMES—$4·00 to $5·00.
MACE—45c. to 50c. per ℔.
NUTMEGS—16c. to 17c.
ORANGES—$2·25 to $2·75.
PIMENTO—5¼c. to 5⅝c. per ℔.
SUGAR—Centrifugals, 96°, 6·52c; Muscovados, 89°, 5·76c.; Molasses, 89°, 5·64c. all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 29, 1916.

CACAO—Venezuelan, $14·00 to $14·25; Trinidad, $13·75 to $14·25.
COCO-NUT OIL—$1·00 per Imperial gallon.
COFFEE—Venezuelan, 14½c. to 15c.
COPRA—$6·15 to $6·00 per 100 ℔.
DHAL—$6·90 to $7·00.
ONIONS—$4·50 to $5·00 per 100 ℔.
PEAS, SPLIT—$10·00 per bag.
POTATOES—English, $5·00 per 100 ℔.
RICE—Yellow, $7·00 to $7·25; White, $7·40 to $7·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., November 29, 1916; T. S. GARRAWAY & Co., November 24, 1916.

ARROWROOT—$5·00 per 100 ℔.
CACAO—$14·00 to $15·00 per 100 ℔.
COCO-NUTS—$24·00 husked nuts.
HAY—$1·75 per 100 ℔.
MANURES—Nitrate of soda, $90; Cacao manure, no quotations; Sulphate of ammonia, $105·00 to $112·00 per ton.
MOLASSES—No quotations.
ONIONS—$5·50.
PEAS, SPLIT—$9·65 per 210 ℔.; Canada, $6·00 per 120 ℔.
POTATOES—Nova Scotia, $4·25 to $6·00.
RICE—Ballam, $7·58; Patna, no quotations; Rangoon, no quotations.
SUGAR—Muscovado centrifugals, $5·25 to $5·50.

British Guiana.—Messrs. WIETING & RICHTER, October 31, 1916; Messrs. SANDBACH, PARKER & Co., October 20, 1916.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$10·00	$12·00
BALATA—Venezuela block	——	——
Demerara sheet	$65·00	68c.
CACAO—Native	12c. per ℔.	14c. per ℔.
CASSAVA—	96c.	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$20 to $24 per M.	$24 per M.
COFFEE—Creole	14c.	16c. per ℔.
Jamaica and Rio	15c. per ℔.	17c. to 18c.
Liberian	11c.	13c.
DHAL—	$6·50 to $7·25	$6·50 to $7·25
Green Dhal	——	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	2c.	——
Madeira	4c.	4c. to 4½c
PEAS—Split	$12·00 to $12·50	$12·00
Marseilles	——	——
PLANTAINS—	24c. to 48c.	——
POTATOES—Nova Scotia	$4·00 to $4·50	$4·75 to $6·00
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	$6·00 to $6·50	——
Creole	—	$5·50 to $6·00
TANNIAS—	$2·88	——
YAMS—White	$2·88	——
Buck	$3·12	——
SUGAR—Dark crystals	$4·50 to $5·10	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	$7·00	——
Molasses	——	——
TIMBER—GREENHEART	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·75 to $6·75 per M.	$5·00 to $7·00 per M.
,, Cordwood	$2·00 to $2·40 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Notes on Transpiration in the Sugar-cane.

RECENT research on transpiration, having special reference to crop plants that grow in the tropics, tends to show that the variation in the amount of water lost is by no means entirely governed by stomatal regulation or by any other simple factor, and can only be explained by a complex of several factors. This conclusion has been arrived at in America by Muenscher* who has compared, not merely varieties, but different species of plants of very distant relationship.

In the Dutch East Indies, Kuyper** has carried out experiments on transpiration in connexion with the movements of the stomata and accompanying water loss in sugar-cane. Abundant watering of the plots in these experiments doubled the amount of water ordinarily transpired. As to the daily course of transpiration, different varieties, it is claimed, may be arranged in three groups, two of these attaining their maxima respectively in early morning and at 11 o'clock, while those of the third group show very small differences during the whole day. These differences in the utilization of available water are supposed to correspond to differences in production and in resistance to drought.

In some cases the daily loss of water was double in one variety than in another. No connexion was established between transpiration rate and stomatal count of leaf area. The maximum transpiration rate may be reached after the stomata have begun to close, the rate of transpiration being in a measure independent of stomatal behaviour. Decrease or deprivation of light decreases transpiration. The varietal differences in transpiration rate are thought to be important as giving a new basis for the selection of canes for certain conditions of soil and climate.

Although extensive observations have not been made in the West Indies, there is evidence to show that certain varieties transpire very much more rapidly than others. The exact cause for this has not been established, and it is probably due, as already intimated, to a complex of factors comprising environment and the constitution of the plant itself; there is not much chance of a clear solution being obtained.

**International Sugar Journal*, October 1916.

***Experiment Station Record*, Vol. 35, No. 4.

Briggs and Shantz†, who have carried out a large amount of work in transpiration in the United States, employing such plants as millets, Indian corn, and sorghums, find that transpiration per unit area of plant surface shows less variation than the transpiration per unit weight of dry matter. In other words, the greater efficiency shown by certain plants in the use of water appears to be due more to a reduction in plant surface than to a reduction in transpiration per unit area of surface.

If this is generally true, we may assume that a resistant cane plant, for example, in time of drought, protects itself by reducing its leaf surface, while at the same time it maintains carbon assimilation at something approaching the normal extent. A variety which is susceptible to drought might not be able to adjust itself in this manner.

The same workers have shown that the natural tendency to transpire, quite apart from conditions of environment, increases with some crops exponentially during the early stages of growth. Sudan grass, for example, doubles its 'transpiration tendency' every four days during the early growth period. This is rather surprising, since as every plant grows older it is anatomically better able to control transpiration on account of the thickening of the cuticle and other changes of a similar nature.

From a practical stand-point a considerable amount of light is thrown upon the problem of water loss from plants by the American work‡ having regard to the relationship between leaf-area and extent of root system in Indian corn and Sorghums.

According to these operations, secondary roots of Sorghum plants as compared with those of corn are twice as numerous per unit of primary roots. The leaf area of the corn plant at all stages of its growth is found to be approximately twice as great as that of Dwarf Milo maize, and never less than 1·5 times that of Blackhull Kafir corn. The Sorghums, therefore, should have the advantage over the corn plant under any climatic condition tending to bring about a loss of water from the plants. The two kinds of Sorghums as compared with the corn plant had only one-half the leaf surface exposed for the evaporation of water, and also a root system which, judging from the number of secondary roots, would be twice as efficient in the absorption of soil moisture.

†*Journal of Agricultural Research*, Vol. VII, No. 4.
‡*Experiment Station Record*, Vol. 35, No. 5.

There is probably some connexion between the relation in the extent of leaf-area and root system which may help to explain drought resistance in varieties of sugar-cane, and the question arises: do drought-resistant varieties have large root systems and small leaf-areas? It is not an easily arranged matter to study the root system of a plant like the sugar-cane, but efforts to do so would probably be well worth while. Presumably extent of root system, at any rate in a horizontal direction, must vary with the number of canes to the stool, for the greater the number of canes the larger the underground stem and, therefore, the larger the root-producing surface. It is well to remember that a variety of sugar-cane having an extensive root system will, other things being equal, make greater demands upon the moisture in the surface soil than a variety whose root system is smaller. But as is known to be the case with Sorghum, variation in leaf-area will decide to what extent the plant uses its water efficiently.

The sugar-cane in respect of its ability to thrive under extreme conditions of environment is perhaps the most remarkable plant under cultivation in the tropics. This can be well appreciated by comparing the limitations of cacao, rubber, limes, and cotton, all of which require very special conditions of environment. One reason why the sugar-cane can tolerate relatively dry, as well as relatively wet, conditions may be on account of the juice stored up in the stem. It may be that the plant carries on over periods of dry weather by drawing upon these reserves of moisture. It is somewhat significant that the variety B.147, which when well established, is a vigorous grower in dry localities, possesses an exceptionally high percentage of juice only moderately rich in sucrose; whereas B.208, which is susceptible to drought, yields only a moderate quantity of juice which is, however, exceptionally rich in sucrose.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant, Imperial Department of Agriculture, left Barbados on December 23 by the S. S. 'Crown of Cordova' with the object of paying a visit to Trinidad. It is expected that Mr. Dunlop will return by the C.R.M.S. 'Chignecto' on January 10.

Observations relating to the staple crop in St. Lucia during November 1916 indicate that the crop is difficult to gauge. Certain localities appear to have suffered from excessive rains and other localities increased their crop. The result will probably be a fairly normal crop. The lime crop is again coming in. The extension of area under limes has practically finished for the present year. The stand of sugar-cane throughout the island was very promising.



SEA ISLAND COTTON MARKET.

GENERAL RISE IN PRICES.

Information was received by cable on December 16 that the prices ruling in Liverpool at that date for West Indian cotton were: St. Vincent and St. Kitts. 36*d.* per lb.; Barbados, 34*d.* per lb.; Nevis and Montserrat, 32*d.* per lb.; other islands 31*d.* to 32*d.*

This Department has obtained approximate estimates of the West Indian cotton crop now being picked. These are as follow: St. Kitts group 150,000 lb.; Montserrat 260,000 lb.; Antigua 40,000 lb.; St. Vincent 180,000 lb.; Barbados 90,000 lb. For purposes of comparison we may reproduce the figures published in the *Agricultural News* for December 2, 1916, showing the quantity of cotton shipped for the year October 1, 1915 to September 30, 1916. This was as follows: Barbados 127,875 lb; St. Vincent 237,387 lb., Antigua 80,250 lb.; Montserrat 279,595 lb.; St. Kitts 131,859 lb; Nevis 99,173 lb.; Anguilla 49,620 lb.; Virgin Islands 22,563 lb. This makes a total of 1,008,288 lb. compared with 720,000 lb. (rough estimate) for the crop now being picked.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States for the week ending November 25, 1916, is as follows:—

ISLANDS. The receipts for the week were 205 bales, sales 180 bales There was an active demand throughout the week for the entire offerings, and at the close 1c. advance was paid, and the market closed firm at:—

Fine	52c. = 53½c. landed.
Extra Fine	55c. = 56½*d.* ,,

The offerings of Extra Fine are very small as the receipts consist largely of Fine. There have been no sales as yet of Extra Fine planters' crops, which are being held at 65c. to 70c.

GEORGIAS AND FLORDIAS. In consequence of the continued demand on account of the Northern Mills the market is active with advancing prices, taking all the limited offerings, which fail to supply the wants of buyers. The holders of cotton both in Savannah and throughout the interior are not very willing sellers and are holding their stocks in anticipation of still higher prices, being encouraged to do so by the advance in the Egyptian market.

The quality of the receipts is falling of. and it is quite impossible to buy unless you consent to take round lots, which do not average more than Extra Choice.

We quote, viz:—

GEORGIAS AND FLORIDAS.

Extra Choice and Fancy	51½c. to 52c	= 53c to 53½c.	landed
Choice	50c.	= 52½c.	,,

with Factors asking a further ½c. advance.

The exports from Savannah for the week were 3,028 bales to Northern Mills, 320 bales to Southern Mills, and from Jacksonville to Northern Mills 2,265 bales.

The United States Census Bureau reports cotton ginned to November 14, as follows:—

South Carolina	938 bales	} making a total of 93,004 bales.	
Georgia	60,857 ,,		
Florida	31,209 ,,		
Against last year	69,477 ,,	Total crop	85,278 ,,
,, 1914	53,875 ,,	,,	78,857 ,,
,, 1913	52,697 ,,	,,	85,444 ,,
,, 1912	41,321 ,,	,,	66,169 ,,

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and fifty-third meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, November 7, 1916.

In the absence of the President (The Rt. Hon. The Earl of Derby, K.G.), Mr. J. Arthur Hutton occupied the Chair.

It was resolved that a letter be sent to Sir Reginald Wingate, the Governor General of the Sudan, congratulating him on his appointment as High Commissioner for Egypt.

INDIA. The Association have been asked to take a practical part in the cultivation of American cotton in the Punjab, and the question is still under consideration.

The opinion was expressed that the time was now opportune for a big effort to be made to develop cotton growing within the Empire, and that the Government should come to some decision as to what they intend to do regarding the question of cotton cultivation in the future.

The Association have proved that cotton can be produced commercially in many of our Colonies, and it now remains for the Government to decide whether every possible effort should be made to develop the cultivation of cotton in the Empire on a large scale. It was decided that representatives of the Lancashire cotton trade should be invited to meet the Council to discuss the cotton situation generally.

WEST AFRICA. The purchases of cotton in Lagos to October 31, amounted to 9,257 bales, as compared with 6,050 bales for the same period of last year, and 13,511 bales for 1914.

The purchases in Northern Nigeria to September 30, were 10,610 bales, as compared with 603 bales for the same period of last year, and 523 bales for 1914.

Satisfactory arrangements have now been made for shipping the cotton to Liverpool, and it is hoped that practically the whole of last season's crop will have been shipped to Liverpool by the end of the year. The reports of the growing crop in Nigeria are very satisfactory, and it is estimated that the crop will amount to between 30,000 and 40,000 bales.

UGANDA. The prospects for cotton in all districts for next season are excellent, and the estimates both from Government and commercial sources point to a crop of 40,000 bales, which compares with 18,000 bales for last year, and about 40,000 bales for the year prior to the war. There has been considerable congestion of traffic in Uganda, but the transport difficulties are now less acute, and there is reason to believe that the balance of last season's crop will reach Liverpool early in the new year.

Statement was submitted of sales of cotton made since last meeting, showing that 4,759 bales have been sold during the month. It is estimated that next season the Association will be called upon to finance a total of about 70,000 bales of cotton, which on the basis of present prices is valued at £1,500,000.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore, the Superintendent of Agriculture, in his report for the month of November states that work in the Experiment Stations was of a routine nature. From the Botanic Station the following plants were distributed: limes, 6.000; budded oranges, 17; grafted mangoes, 14; ornamental, 10. Beyond the fitting up of a building for storing seed corn for distribution, operations here consisted in routine garden work. Relative to staple crops, the condition of cacao is said to be good, on the whole; the crop promises to be an average one. The lime crop is characterized as very good, and sugar is normal A new lime plantation has been started near Calivigny; while in connexion with the new cane crop, ploughing and planting are said to be in progress at Grand Anse. As regards pests, thrips are reported on some cacao estates to have decreased, as a result of heavy rains, but this pest is proving very troublesome in several districts. Frog-hopper on canes was discovered in St. Andrew's parish; investigation is proceeding. Officers of the Department were specially concerned in the buying and storing of 60 barrels of corn on cob for seed purposes next Spring. The weather for the month was very wet. Rain fell about every day in the month: one interior estate recorded 36·31 inches. At Richmond Hill, the total precipitation was 15·10 inches, and rain fell on twenty-three days. Among the coming events of interest and work contemplated, are noted, consideration of the question of a corn drier and granary for Grenada and Carriacou, and thrips investigation work.

ST. VINCENT. Mr. W. N. Sands's report for the month of November mentions the reaping of a small plot of African ground nuts in the Experiment Station, which gave a calculated yield per acre of 2,172 lb. Other work in the station included the sowing of hybrid cottons, and collecting selfed cotton seed. In the Botanic Gardens general routine work was done. A report on the damage done to staple crops by flooding rains was submitted. A small outbreak of cotton worm occurred at two estates: dusting of the plants with insecticide was carried out. The reaping of arrowroot was retarded by the wet weather. At the Government Ginnery the Agricultural Superintendent devoted attention to experiments with the expelling of oil from the meat of ripe cocoanuts and the perfecting of arrangements for the storage of corn. Over five hundred 1 cwt. bags of kiln dried corn have been stored, and there is room for another 80. A visit of Mr. W. Nowell, Mycologist, in connexion with diseases of cotton at the Experiment Station is recorded. The weather was abnormally wet, the rainfall at the Botanic Station being 32·52 inches; at the Experiment Station 29·82 inches were recorded.

ANTIGUA. In his report for the month of November Mr. T Jackson (Curator) states that in the Experiment Stations routine work was performed. Plant distribution included 444 Eucalyptus, 350 lime, 269 Prosopis, 25 miscellaneous economic, and 12 decorative, plants; 40,800 sweet potato and 6,800 cassava cuttings, 111 lb. corn, 17 lb. beans, and 18 packets vegetable seeds. In the Botanic Gardens ordinary routine work was performed. Touching staple crops Mr. Jackson says the cane crop continues to make good growth; ratoons are somewhat low in places but are growing rapidly. The condition on the whole, however, is perhaps not quite as good as at this time last year. Considerable areas are being prepared for the planting of food crops. A survey of Sawcolts estate was made to ascertain whether it might usefully be considered in connexion with a Land Settlement Scheme. In a brief report on agricultural instruction, it is mentioned that during the month thirty peasants' holdings were visited. The peasants are realizing the possibility of a shortage of food supplies, and are in consequence planting increased areas of ground provisions. They were advised to plant a diversity of crops so as to prevent loss and wastage by an overplus of any one crop. The rainfall for the month was 12·10 inches; for the year to date 63·13 inches.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, writes to say that plant distribution for the month of November comprised 3,700 sweet potato cuttings, and 20 lb. white velvet beans. The condition of the Botanic Gardens has much improved In regard to staple crops, he states that the condition of the old cane crop is all that can be desired for the time of year. The earlier planted canes and forward ratoons are arrowing more than usual, and reaping will have to commence earlier in consequence. The young cane crop is now being put in, and greater attention is being paid to selecting the best cuttings for planting: in many cases the best plant canes are being used. The best seedling varieties are being tried on a larger scale, but B. 147 and White Transparent occupy the largest areas. Owing to the very heavy rainfall the cotton crop has been practically a failure; only in a few instances has there been a fair return. On the estates the plants are now being turned under to prepare the fields for canes. Cotton stainers have not yet appeared in any number. At a meeting of the Agricultural and Commercial Society held on November 7, a letter from the Imperial Commissioner of Agriculture in reference to the planting of corn and ground provisions was discussed. At a meeting of the Society held on the 22nd, Mr. Edgar Tripp, of Trinidad, was present in connexion with the question of an Associated Chamber of Commerce for the West Indies. A summary of work conducted at the Government laboratory included analyses of samples of milk and filter-press cake, physical analyses of soils, examination of soils for acidity and amount of lime to be applied to neutralize acidity, and examination of samples of cotton lint. The rainfall for the month was 5·94 inches, and for the year to date, 63·17 inches.

DOMINICA. In his report for the month of November, the Curator states that the local price paid for sound yellow limes has risen to 6*s.* per barrel; many estates expect a fair second crop in December and January. Referring to the increased plant distribution mentioned in the previous issue of the *Agricultural News*, Mr. Jones regards this as indicative of a certain revival of planting activity, and states that owing to increased cost of labour, the price of lime plants will be raised from 3*s.* to 4*s.* per 100 on April 1 next. The rearrangement of the plots in the lime experiment station, which became necessary as a result of the recent hurricane, has received the approval of the Commissioner of Agriculture. Work in the chemical laboratory included the testing of a number of samples of juice sent in by planters, and the determination of the lime requirements of a number of samples of soils. Two samples of citrate of lime were analysed. Wet weather prevailed during the month, the rainfall recorded being 14·28 inches.

MONTSERRAT. Mr. W. Robson, the Curator, reports that during November a $\frac{1}{10}$-acre of the new Gambia ground nut under trial in the Experiment Station was reaped and gave a poor return. White velvet beans on pigeon pea supports do not promise well. Lime trees between Gliricidia in the station are suffering in the usual way from disease; spraying and mulching have been resorted to. Plant distribution for the month included the following: lime plants, 280; bay plants, 1,680; sword beans, 4½ lb.; black-eye peas, 39 lb. and 40 small packets; bush Lima beans, 3 lb. Routine work in the Botanic Gardens included the transplanting of bay seed

lings into beds. Three distillations of bay leaves were made. Plants of *Hyoscyamus muticus* are being raised in pots; sixteen plants of the new tree *Quebrachia Lorentzii* have germinated. A plot of a new black-eye pea from St. Vincent has been planted.

The early part of the month continued to be wet, and there was considerable trouble in getting picked cotton dried. Only restricted local areas, planted early, have given a good second crop, but quite sufficient to show the possibilities in the second crop where early planting is practised and due regard paid to the control of cotton stainers. Low percentages of cotton are as a rule being obtained at the ginneries, and the results from the last two seasons indicate a connexion between a wet season and a low percentage of lint. Touching pests, Mr. Robson says no very marked benefit is yet shown in the condition of lime fields as the result of the recent wet weather, and within the last four months, in spite of the rains, there has been a striking development of purple scale and the usual decline, on certain areas. Cotton stainers are now abundant in many districts, and at this time of the year no effort is made, nor is it apparently considered worth while, to control them. There has been generally, a marked cessation of attacks of the cotton worm, and large areas have the appearance of young growing fields. In continuation of previous work, a survey was made of the Grove lime fields in the course of a study of diseases; the recent development of purple scale is very puzzling. Visits were also made to other districts, as a result of which several specimens of diseases amongst which is apparently a new trouble on corn (maize) plants, have been submitted to the Head Office for examination.

Sixty plants of the St. Kitts No. 342 cotton were examined for lint length and per cent. of lint The type is not found to be any more uniform than some of those already in cultivation. Twenty-nine samples of bay oil from the distillations made in 1916 were sent to the Government laboratory for examination. Weather conditions seemed to have been abnormal. A heavy downpour of $5\frac{1}{2}$ inches in two hours in the Harris's district on the evening of the 17th did serious damage to roads. It has been decided to close Harris's Experiment Station at December 31, 1916. Arrangements are being made to plant the sugar-cane experiment plots at Whites and Farrels estates. The rainfall recorded at Grove Station for the month was 7·70 inches.

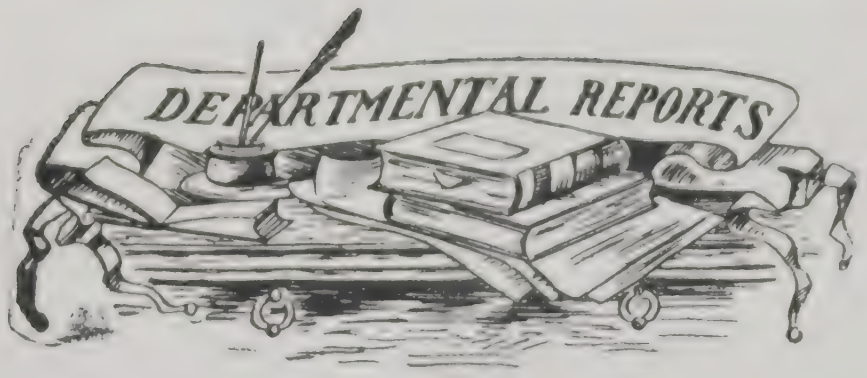
NEVIS. Mr. W. I. Howell, the Curator, writes to say that during November the plots in the Experiment Station have all been kept weeded and in good order. Cotton plants in the demonstration plot have taken on a very promising new growth and a good second picking is expected. The plot of Indian corn is ripening and a good yield is expected; while the plot of onions continue to make good progress. During the month 900 sweet potato cuttings were distributed from the station. As regards staple crops, the cane crop continues to look green, but the return will not be as good as last year's. Preparation for next year's crop is in progress and several fields have already been planted. The cotton crop throughout the island has taken on a new growth, and should the weather continue favourable, a good second picking would be obtained. Practically the whole of the crop reaped has been sold to a local purchaser at prices ranging from 1*s.* 10*d.* to 2*s.* 2*d.* Cotton stainers are very plentiful this season, and there is a fairly high percentage of stained cotton, due to unfavourable weather and internal boll disease. There is a large acreage under provision crops, chiefly sweet potatoes, yams, and tanias; all are doing well. The rainfall for the month was 6·74 inches, for the year to date, 59·30 inches. Planting an acre plot in different varieties of castor seed is mentioned as work contemplated.

VIRGIN ISLANDS. Mr. W. C. Fishlock (Curator) reports that very little work was possible in the Experiment Station during the month of November consequent on the recent hurricane, labour available being employed in the work of clearing up. Plant distribution included the following: peas, 109 lb. to 118 persons; corn, 559 cobs to 137 persons: 582 lb. of nails were also given to 366 persons. As regards staple crops, a fair amount of cotton has come in, chiefly from Virgin Gorda. This island does not seem to have suffered so much from the hurricane. Some cotton has also been received from different parts of Tortola, Jost van Dykes, etc. The total amount of seed-cotton received to date is equal to 33 bales ginned cotton of 250 lb. each. Visits, chiefly in connexion with Hurricane Relief work, were paid by officers of the Department to out-posts of Tortola and also to Jost van Dykes. The weather was rainy. Rain was measured on twenty-five days of the month, the total being 11·02 inches. The average rainfall for the same month for the past fifteen years is 7·09 inches. It is hoped shortly to start in earnest the work of clearing up the Station.

Ordinance to Regulate Fishing at Trinidad.

—The Governor of Trinidad and Tobago has assented to an Ordinance empowering him to make regulations regarding certain matters affecting fishing within one marine league of the coast of the Colony. Regulations may be made for all or any of the following purposes: (a) for prescribing the size of mesh, forming dimensions of nets or appliances for fishing and for the manner of using the same; (b) for restricting the size of fish, crabs, shrimps and turtles that may be taken, and prohibiting the sale or exposing for sale of such as are under such size as may be prescribed by the regulations; (c) to prevent the taking of fish at such times and within such areas as may be defined; and (d) for naming and prescribing the duties of persons authorized to see to the carrying out of the provisions of this Ordinance. It should be observed that the objects in view have been, in large measure, left to be worked out by means of regulations instead of provisions being inserted in the Ordinance itself. This has been done deliberately with the intention of proceeding gradually to carry out the objects sought to be attained, and also with a view to the greater elasticity of regulations.

Some interesting facts concerning the palm kernel trade of Sierra Leone are published in *Colonial Reports*—Annual, No. 888 (1915). The exports during 1915 showed an increase in volume of 3,709 tons, and a falling off in value of £55,280. The total value of the products shipped was £504,133. The decrease in the market value of this product was very noticeable. The price in Europe at one time fell as low as £12 10*s.* a ton, whereas in the preceding year the price never fell below £16, nor in 1913 below £21 per ton. Prices however rose steadily towards the end of the year, and reached £19 a ton in December. In the year under review the whole quantity of palm products exported went to the United Kingdom instead of to Germany. In the United Kingdom crushing mills have now been established, and nut butter or margarine into the composition of which the oil of the palm kernel largely enters, is now recognized as a nutritious form of diet. It is at present in general use in the United Kingdom, and will probably sustain its place on the market even when the present inflated price of butter again becomes normal.



ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1915-16.

This report, which is longer than those of previous years, is a record of a large amount of work of a valuable and diversified character. The section dealing with the Botanic Gardens contains information in respect of certain improvements that have been effected, including the erection of a memorial temple and fountain to the memory of the late Hon. J. G. W. Hazell. A circular lily pond has also been constructed, in which a fine collection of tropical lilies, presented by the Royal Botanic Gardens, Kew, has been planted. Work in the nurseries during the year was considerable, and a large number of plants of a varied character, chiefly cacao plants, onion and lime seedlings, together with various provision crop cuttings, were distributed.

The work of cotton selection has been continued, principally in relation to selection for resistance to disease and for desirable lint characters. There has been some revision in the methods employed, and the work is now conducted on a sound scientific basis. Interesting breeding experiments with cotton, of a special character, were carried out by the Assistant Agricultural Superintendent, the results of which have also appeared in the *West Indian Bulletin*.

Extensive operations and experiments were made during the year in connexion with the cotton stainer: by the Agricultural Superintendent in respect of native food-plants and the feeding habits of this pest; by the Assistant Superintendent in conjunction with the officers of the Imperial Department of Agriculture, in regard to the part the stainer plays as a carrier of internal boll rot disease. A considerable amount of other entomological work was done by the Assistant Superintendent during the year, notably that on the egg-parasites of *Trichogramma minutum*. Included in the present publication are reports by the Entomologist and Mycologist of the Imperial Department of Agriculture on the subject of their visit to study the condition of cacao in St. Vincent in January 1916. In this report the view is held that permanent infestations of thrips are always associated with unhealthy states of the cacao tree. This report also brings out the fact that the successful cultivation of cacao in St. Vincent depends largely upon preventing loss of water from the soil by means of overhead shade.

Useful work is being done to improve the native types of Indian corn. The work of corn improvement is developing along the following lines: (1) the production of a uniform yellow corn; (2) to increase the size of grain and the amount of grain per ear. Much attention has been given to the biology and control of the pests attacking this crop. A considerable amount of experimental work is recorded with peas and beans, the area under which crops it is the aim of the Department to extend.

Concerning progress in the chief industries, it is reported that the season was unfavourable for cotton on account of excessive rainfall and disease. The actual area planted was low, as was also the yield of lint per acre. The total crop reaped was the lowest of any for nine years. Now that the cotton stainer problem has been taken in hand and effectively dealt with, better results may be looked for in future seasons, though the weather is the ultimate determining factor of crop yield.

The condition of the starch industry, as far as the statistics show, was more satisfactory. As regards sugar-cane, a large increase in output is recorded. This was to be anticipated, as is a further large increase next year. As regards progress in the minor industries, there has been an extension of the area under ground nuts, coco-nuts, and peas.

An account is given in the report of the Anderson Oil Expeller, also of the Government granary and corn-drying arrangements. The co-operative buying of corn on a similar plan to that employed in the case of cotton is important. The Agricultural Credit Societies established in this island, appear to remain in a satisfactory position.

As regards weather, it has been stated in connexion with the remarks on cotton, that the season was a very wet one. The rainfall recorded at the Botanic Gardens was 122·74 inches, which amount is 16 36 inches above the mean of the past twenty-two years. At the Experiment Station nearby, but at a lower elevation, the precipitation amounted to 102·15 inches, which exceeded the mean of fifteen years by 9·42 inches.

Appended to the main body of the publication is the report of the Government Veterinary Surgeon. No cases of anthrax were recorded during the year. There were two cases of tetanus diagnosed, and two of tuberculosis in the abattoir; one of these latter was a cow that had been supplying milk for sale to the public. During the year, 721 animals valued at £3,571 were exported. These figures do not represent the entire stock exports of the Colony, as sheep, goats and pigs are admitted at Trinidad without a veterinary certificate, and so are not recorded.

CEYLON: REPORT ON THE DEPARTMENT OF AGRICULTURE FOR 1915.

In order to effect a reduction in the size of this publication extracts or summaries from the reports of the Divisional Officers of the Department have been embodied in the Director's administration report.

Attention is given first to coco-nuts. There are about 1,000,000 acres under this crop in Ceylon and the area steadily grows. On many estates, light ploughing is systematically practised. The coco-nut industry suffered during the year owing to the fall in price of copra. Manurial experiments have been in progress, and the results of these are given separately in another article in this issue of the *Agricultural News*.

In regard to tea, the year 1915 was the most prosperous year that the Ceylon tea industry has experienced, due to a well distributed rainfall and high prices. Manurial experiments have been conducted, also experiments to determine the effect of rubber shade. The loss of crop, due to the shade of rubber trees and competition with the rubber roots, is clearly demonstrated.

Concerning rubber itself, the exports of this product showed an increase of over 40 per cent. and an excess of 38 per cent. on the quantity and value exported the previous year. As regards this crop, therefore, the year was very satisfactory. Concerning experimental work with rubber, tapping experiments and manurial experiments have been in progress. It would appear that manuring does not have much effect upon increasing the girth of the trees, while the average

percentage of rubber in the latex from the unmanured and manured plots was 31 and 32·8 per cent., respectively. The more scientific research on rubber has concerned vulcanization, the effect of tapping on food reserves of Hevea, and the resting period of rubber trees.

The information relating to cacao in this report shows that the exports and prices obtained were better than in 1914. Manurial experiments are being conducted with cacao, also experiments to ascertain the most favourable spacing for Forastero cacao at an elevation of from 500 feet to 18,000 feet, at which elevation cacao is grown in Ceylon; also the most suitable temporary shade and the best green manures to apply.

Other industries dealt with in the report are cinnamon, rice, and tobacco.

The section of the report dealing with the Royal Botanic Gardens contains an extract from the report of the acting Botanist and Mycologist on the Ceylon Flora. This is of interest in view of the fact that there is a general impression in botanical circles in Great Britain that no attention is given to pure botanical work by Agricultural Departments and Botanic Gardens in the British tropics.

Information relating to school gardens indicates that the majority of school gardens continue to maintain a high standard of efficiency.

The last three pages of the report contain notes on miscellaneous subjects of considerable interest. The acidity of Ceylon soils has been investigated, and it is thought possible that the acidity of Ceylon soils has not been sufficiently allowed for in manuring schemes adopted on estates, and that the full benefit of ammoniacal and organic nitrogenous manures, has through a deficiency of basic constituents, not been attained. In regard to the shortage of potash it has been shown that for tea, and to a less extent for rubber, potash has not the importance usually assigned to it, and it is suggested that the popularity of this manure in Ceylon is no doubt due as much or more to advertisement by the German potash Syndicate than to the results of actual trial and observation.

There is a section in the report having reference to insect pests.

A note appears in the report on the effect of dynamite. So far as the figures go, they seem to indicate that the effect of dynamite on rubber trees, manifested more in the height than in the girth of trees, is not considerable.

The report concludes with an account of the publications issued by the Department, and a statement of receipts and expenditure.

LUXURY TRADE RESTRICTIONS AND THE PRICE OF LIME OIL.

A restriction in the demand for essential oils for the confectionery trade, says the *Perfumery and Essential Oil Record* (November 1916), is a probable sequence to the new Government proposals in regard to the national food supply. These restrictions principally concern the supply of sugar, and the fact that sugar supplies have been reduced by the Sugar Commission to 65 per cent. of previous supplies, proves that the out-turn of confectionery must be correspondingly lessened. The above Journal points out that the new sugar restrictions may be followed by official embargoes on other luxury trades, and that the manufacturing perfumers would be well advised in marshalling their influence and arguments in advance

It cannot be said, however, that a restriction in demand for lime oils has yet made itself felt. In fact, the feature of the market for over a year has been the great demand and high prices paid for distilled lime oil, especially. The market price for this product, which in normal times averages 2*s.* to 2*s.* 6*d.* per ℔., advanced to 10*s.* per ℔. at the end of March 1916. The price ruling during November of the present year was 9*s.* per ℔. spot, and the market was very firm indeed. During this month hand-pressed oil made a big advance to 15*s.* per ℔., the normal price for this product being 6*s.* per ℔. In the New York market during October, expressed lime oil was being firmly held as supplies had diminished, and the price quoted was $3·25 to $3·35.

It would not appear, therefore, that there is any depression in the lime oil trade, though it is as well to have regard to the fact that restrictions placed upon other products with which lime oil are used in the manufactures may have the result in the future of reducing the demand, and the market price.

It may be noted that during 1915-16, the output of both distilled and hand-pressed oil from Dominica was below the average. The shortage was largely due to the great demand for raw lime juice for making beverages. Local buyers of raw juice endeavoured, as far as possible, to obtain their supplies from unécuelled limes so as to secure with the juice as large a supply of oil as possible, the chief reason for this being that lime oil is the best preservative of the raw juice.

It is possible that the recent advance of hand-pressed is the result of this reduction together with the possibility of short supplies next year on account of the damage to the lime crop, occasioned by the hurricane last August.

EFFECTS OF NICOTINE AS AN INSECTICIDE.

The following is the summary to a paper on this subject by N. E. Mc Indoo in the *Journal of Agricultural Research* (Vol. VII, No. 3). The pharmacological effect of nicotine (C_{10} H_{14} N_2) on the higher animals is well understood, but until recently there was practically nothing known about the pharmacological effects of nicotine on insects:—

(1) Nicotine spray solutions do not pass into the trachæ, nor do they penetrate the integuments of insects.

(2) The fumes from nicotine used as a fumigant, the vapours from nicotine spray solutions, and the odoriferous particles from evaporated nicotine spray solutions or from powdered tobacco pass into the trachæ and are widely distributed to all the tissues.

(3) Regardless of how it is applied, whenever nicotine kills insects, as well as all other animals, it kills by paralysis, which in insects travels along the ventral nerve cord from the abdomen to the brain.

(4) The writer does not know just how nicotine paralyzes the nervous system, but he does know that it prevents the nerve cells from functioning, and that in regard to the simplest animals, its presence around the cells causes the same structural changes resulting in death as observed when other animals of the same kind are deprived of oxygen. In such cases it seems to kill physcially rather than chemically, but the evidence presented does not conclusively prove this view. In the higher animals it may kill by interfering with oxidation in the cells. Whether this is accomplished physically or chemically the writer does not know, but concluding from the properties of nicotine, he is inclined to attribute more to its physical effects than to its chemical effects.

EDITORIAL NOTICES.

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All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue comprises notes on the loss of water from varieties of sugar-cane.

Two departmental reports are reviewed in this issue: one on the Agricultural Department, St. Vincent, and the other on the Department of Agriculture in Ceylon.

Interesting notes appear in this issue on lime cultivation in Sierra Leone, and on the concentration of lime juice by freezing.

Insect Notes deal with pests of sugar-cane in British Guiana: Fungus Notes concern the fungus on cacao thrips.

Scheme for Encouraging the Planting of Coco-nuts.

A scheme for the encouragement of coco-nut planting near the littoral of Sierra Leone has been sanctioned by the Government of that Colony: £100 has been approved in the 1916 estimates for the purchase of good Ceylon seed nuts. These nuts will be sold to certain people, either at half what they cost the Government landed in Freetown, (in which case after the period of about four years, the purchasers will receive a bonus for each healthy tree,) or the nuts will be distributed free of charge, and no bonus will be provided. The selling price of the nuts and the amount of bonus to be distributed have not yet been definitely fixed, but it is probable that where the nuts are sold, 2*d.* each will be charged the buyers. It is stated that there are large areas of land along the southern shores of the Protectorate where the soil is sandy to a sandy loam, and the natural drainage good, which is eminently suited for coco-nut cultivation: the coco-nut trees already growing there point to this fact.

In connexion with the scheme of encouragement, it would seem that actual nuts—not seedlings—will be sold. It would appear that 2*d.* is a high price to charge for single nuts, and in any case it would probably be found more satisfactory in the long run to send out seedlings. The idea of giving a bonus for every healthy tree produced is a good one, and should have the effect of causing greater care to be taken by the native growers.

The Chinese Banana in Jamaica.

According to the *West India Committee Circular* for November 2, 1916, it has been advocated in certain quarters that the Chinese or Canary banana (*Musa Cavendishii*) should be grown in Jamaica instead of, or in addition to, the Gros Michel variety now in favour among the local planters. It is pointed out that the short and sturdy banana tree offers a greater resistance to heavy winds than the rather top-heavy Jamaica banana tree does. Again, the flavour of the Chinese is preferred, especially by people in England and the West Indies, to the Jamaica one, though this is not the case in America. The principal objection to substituting the Chinese banana for the Gros Michel lies in the fact that the former must be carefully packed for shipment in crates, whereas the latter can be exported in bunches. The crated bananas although certainly safe from bruising, take up twice as much room in the hold of the ship as a bunch, and therefore the cost of freight is double. Another objection to shipping the Chinese banana is that in America—which is Jamaica's market—it is found to lack staying powers when once ripe, and also, as already pointed out, the American consumer prefers the bigger fruit. It follows, therefore, that planters will be well advised to continue to plant their present variety of banana tree. At the same time it would probably prove profitable to put in a certain number of acres of Chinese bananas, which will grow at higher elevations than the more tropical Gros Michel kind, in order to provide fruit for local consumption, which is not inconsiderable.

In discussing the banana question in Jamaica, it may be observed that a general movement is now on foot with a view to substituting sugar-cane for bananas in some districts, on account of the fact that sugar-cane is a good wind-resisting plant, and also because sugar itself is now so profitable. The experience of the past few years seems to indicate that Jamaica would be wise to make herself less dependent upon such an easily perishable crop as the Gros Michel banana.

Crop Yields in England and Wales.

According to returns published by the Board of Agriculture, the total production of wheat in England and Wales this year (1916) amounts to 6,942,559 quarters, or about 1,500,000 quarters less than last year, but greater than in 1912 or 1913. The yield per acre, 29·05 bushels is about 2 bushels below that of 1915. Barley, although about $1\frac{1}{2}$ bushels per acre below average, is better than last year, and, with the acreage increased, has given a total nearly 700,000 quarters in excess of 1915. Oats are only very slightly below the average, and slightly better than last year; the total production, 10,461,164 quarters, is the largest since 1910. Beans are over average by three-tenths of a bushel per acre, and 2 and $2\frac{2}{5}$ bushels per acre above last year, but as the area has been reduced the total production is rather below that of 1915. The yield of peas is practically identical with that of 1915, and $1\frac{3}{4}$ bushels below average; in this case also, owing to a reduced acreage, the total production is less than in 1915.

The yield of hay from clover, sainfoin, and grasses under rotation is 32·9 cwts. per acre—nearly 4 cwts. above the ten-year mean, and the third highest recorded since the returns were first collected; the total production is more than 600,000 tons greater than in 1915, and the highest since 1907. Hay from permanent grass is $1\frac{2}{3}$ cwts. per acre above the average; the total production is more than 1,600,000 tons greater than the poor total of last year. Taking both categories together, the entire production of hay is estimated at 8,837,079 tons, which is 2,250,000 tons, or fully 34 per cent., more than last year.

The returns of the production of potatoes and roots are collected at a later date, and will be issued subsequently.

These figures show that in spite of the war and the drain it has made on agricultural labour, British farmers have with the help of soldier and women and boy labour, been able to carry through the year and reap satisfactory crops.

Lime Cultivation in Sierra Leone.

The Agricultural Department of Sierra Leone started lime plantations at the end of June 1913 at its experimental farms, subsequent to a visit to the West Indies by one of the staff. The area of the plantation at South Farm is 0·4 acre. According to the report of the Agricultural Department for the year 1915, the average height of all the trees at two years, three months, was 5 feet 10 inches. In one section of the plantation deep hoeing was carried out, and here the trees are stated to be fine and bushy, and of great vigour. The average height on this section is a little over 7 feet. It is stated that the limes on both areas have lately been attacked by a larva which enters the young growing shoot and tunnels up it. The pest is stated to be very destructive to new growth.

On the North Farm there is another lime plantation occupying an area of 1·3 acres. The report under notice contains illustrations of these lime plantations hoed and not hoed. Provided the pest referred to above does not prove to be destructive, it would appear that lime cultivation can be satisfactorily carried on in this part of Africa.

American Views on Sugar Mills in the West Indies.

A leading article of an interesting and in some respects of a humorous character, appears in the *Louisiana Planter* for November 25. Its aim is to correct certain statements issued by the United States Department of Commerce in regard to the standard of milling that exists in the West Indies. The Department of Commerce has stated, 'In the West Indies American mills are not regarded with the same favour accorded those of English make. It is complained that the American mills do not "stand up under the work" as do the British machines. Most of the owners use equipment very roughly, leaving it exposed to torrential rains and tropical sunlight from one season to another. As a rule, the cane mill operatives, through ignorance, do everything that ought not to be done, from overfeeding the rollers, to all other conceivable and inconceivable ways of abusing machinery and exercising lack of judgment or care.'

The Department's remarks then go on to refer to West Indian cane mills as being manufactured only at Derby in England. It is admitted that some mills of American make are undoubtedly being sold in the West Indies, but the main argument for their sale, it is said, is the difficulty of procuring English mills.

As pointed out by the *Louisiana Planter*, these statements display great official ignorance, and simply indicate that the writer has no knowledge at all of the conditions of sugar-cane factories in the West Indies, where in most places factories can be found which are amongst the most skilfully worked in the world, and in which both British and American, not to mention mills from other countries are giving satisfaction. One of the most extraordinary misconceptions of the Department of Commerce is that Derby is considered the only centre in England for the manufacture of sugar machinery. Apparently the writer is not acquainted with the fact that there are large firms in Glasgow.

INSECT NOTES.

PESTS OF SUGAR-CANE IN BRITISH GUIANA.

II.

In the last issue of the *Agricultural News*, the first part of this article, which deals with the control of sugar-cane pests, concerned the small black hard back. The present part of the article has regard principally to the borers.

THE SMALLER MOTH BORERS (*Diatraea saccharalis* and *D. canella*). These insects still continue to be the most important of the sugar-cane pests, in spite of the great advance in the collection of egg masses and caterpillars. Mr. Moore considers that these pests will not be controlled until adequate, persistent, and systematic work can be kept up, throughout the end year grinding season, at which time the campaign against them ought to be hardest. The shortage of labour, however, allows of practically no work being done during the three months of the heavy grinding season (October to December), so that the borers increase rapidly in the young fields during and immediately after this period. The clearing and burning of large continuous areas brings about a deficiency of parasites, as Mr. Quelch has pointed out, and this explains the usual heavy infestation of young fields by borers during the early months of the year.

The collection of egg masses has grown from nearly 180,000 in 1913 to over 500,000 in 1914, and over 812,000 in 1915. But the greatest possible benefit was not always derived from the egg collecting, because adequate provision was not made for storing the clusters and distributing the parasitized ones in the fields. The numbers of caterpillars collected dropped from 25,583 987 in 1913 to 20,888,042 in 1914, and 19,436,345 in 1915, but this decrease was more than offset by the great advance in the collection of egg-clusters. In discussing the treatment of replants, Mr. Moore recommends that the eggs be collected and the borer cut out from the old bank spring before the plant tops start to shoot, since the plant top spring is almost invariably attacked if the borer in the old bank spring is left uncontrolled. These reports make mention of six new food-plants, four of which belong to the genus *Paspalum*, including *P. gracile* and *P. virgatum*. These are all grasses growing in moist conditions, except *P. virgatum*. The remaining two food-plants given are a sedge (*Cyperus* sp.) and another water grass, *Panicum elephantipes*. This seems to show that among wild plants *D. saccharalis* has a preference for more or less aquatic grasses, and may indicate that wet weather might be favourable to this borer in the cane fields. Mr. Moore has not studied the influence of weather conditions on these borers enough to be able to make any positive statements. He has found, however, that during dry periods the egg-clusters collected were very small, whereas the average size of the clusters become normal as soon as the rains started.

Among predaceous enemies of the Diatraea larvae are mentioned a fly (Diptera, family Stratiomylidae, *Sargus* sp.), an undetermined beetle larva (Coleoptera, family Carabidae) and a Pseudo-scorpion. These, however, are not of special importance in the control of the borer.

THE GIANT MOTH BORER (*Castnia licus*).

This pest may now be considered as under control on most estates. The good work against the moths and caterpillars must be kept up systematically and persistently, since control does not mean elimination.

The campaign against the grubs in 1915 was harder than ever, especially on the three worst infested estates, and if this work is kept up in the future, there is no doubt that the control of Castnia will be as effective as it is on the others.

TERMITES OR WOOD-ANTS.

Wood-ant infestation continued to decrease as a result of the persistent and systematic destruction of nests.

It is urged that nests be destroyed not only from cropped fields, but from growing canes up to eight or nine months old, since nests are often built upon the cane stems and the removal of these nests would further help to check the breeding of this pest.

THE LARGER HARD BACK.

This reddish-black hard back (*Lyyyrus ebenus*) caused slight injury to cane stools both in 1914 and 1915. It was found only in certain fields adjacent to savannah lands covered with the sedge (*Cyperus* sp.) one of its native food plants. This insect will require watching.

FROG-HOPPER (*Tomaspis flavilatera*).

The frog-hopper is an insect that must be carefully watched to prevent its becoming a serious pest. It is found on grasses near the coast and in abandoned cane fields. Mr. Quelch discovered that the larva of a fly preys upon the frog-hopper nymphs. This was found to be *Salpingogaster nigra*, which attacks the frog-hopper in Trinidad.

Mealy-bug was not very prevalent, but caused some trouble on a few estates. *Aspidiotus sacchari* and *Orthezia proelonga* are also mentioned as having occurred, the former on poor stools, the latter on cane blades.

LEAF FEEDERS.

The grass-looper (*Mocis repanda*), and the rice-worm (*Laphygma frugiperda*) are mentioned as doing local damage, but a serious outbreak was prevented in each case by collecting egg-clusters or picking the caterpillars.

The brown locust (*Schistocerca pallens*) was abundant on one estate in 1915, but was soon controlled by collecting. The green grasshopper *Conocephaloides maxillosa* is also mentioned, but was not important. A small brown Chrysomelid beetle (*Myochrous armatus*) was fairly plentiful on several estates in 1914 during the rainy season. These beetles hide in the earth, or in the young shoots in which they eat holes

J.C.H.

Intercepting the Argentine Ant.—An article under Insect Notes sometime ago dealt with the Argentine ant and the methods of controlling it, showing how necessary and difficult these were, and how destructive this domestic pest is in the Southern States of America and in South America also. In the report on the Division of Plant Inspection at Honolulu, Hawaii, an account is given of how the prompt discovery and extermination of a colony of these ants which came for the Pacific coast of America with a shipment of plants, kept out from Hawaii a pest which is becoming a great nuisance in California and other places, as already stated. In regard to the present instance of interception, it is stated that some ants were seen running about the cases which contained the plants. The colony, however, was not in this particular case, and the whole shipment had to be examined before eventually the colony was discovered in a corner of a box of carnation plants. This box and another which also showed a few ants were wrapped in oil tarpaulins and fumigated overnight. Luckily the whole

shipment had been stored in a fumigation house, otherwise the colony might have migrated overnight and lodged itself in some of the numerous cracks that are found on nearly all the docks. It should be mentioned that before examination the whole shipment was fumigated with hydrocyanic acid gas.

COTTON SELECTION AND SEED SUPPLY IN MONTSERRAT.

The following information is taken from the Report on the Agricultural Department, Montserrat, for 1915-16:—

FLUCTUATION IN LINT LENGTH FROM SEASON TO SEASON.

One of the features of interest in connexion with the cotton selection work of the year under review, was the very considerable increase in lint length on the average of all the types examined.

The following data are given for a few of the strains examined, the figures representing the average maximum length of pulled lint:—

Heaton 9	Av. on	16	selected	plants	1914-15	47 mm.
,, ,,	,,	24	,,	,,	1915-16	52 mm.
St. Kitts (Thurston's)	,,	40	,,	,,	1914-15	48 mm.
,, ,,	,,	45	,,	,,	1915-16	53 mm.
Douglass'	,,	14	,,	,,	1914-15	51 mm.
,, ,,	,,	42	,,	,,	1915-16	53 mm.

The method of examination in each year was the same, and it is now clear from the evidence supplied by the work of Mr. Lawrence Balls in Egypt, that we can expect similar fluctuations in lint length in the same strain of cotton, from season to season, depending on the climatic conditions during development, the rainfall in particular.

The rainfalls at Grove Experiment Station for the two years were (inches):—

1914: April 2·93, May 7·32, June 4·19, July 6·34, August 3·12.
1915: April 9·78, May 4·42, June 4·43, July 8·72, August 8·79.

In both seasons the cottons mentioned above were planted in April or early May, which meant that the flowers were opening from late June onwards; the length of the lint being determined during the month that follows the opening of the flower, it is evident that the low rainfall in August 1914 was unfavourable for the development of lint length.

A NEW SYSTEM OF SEED SUPPLY.

As the result of facilities extended to the Department by the Montserrat Co., Ltd., it was possible to plant a field of the closely bred Heaton 9 type of cotton, for the purpose of providing seed for distribution to estates, on a more generous scale than has hitherto been possible. The seed from this field has been distributed to estates, on the understanding that it is to be used to plant a seed field to provide next season's supply of seed for the whole estate. Practically all the cotton estates have fallen into line and taken seed with this end in view, the amount of seed allowed, enabling one-tenth of the total acreage in cotton to be planted.

This system of seed supply it is intended to follow up each year, and it means that not only will the general character of the type be maintained on a high level, but that should a better type of cotton be secured, the old strain can be replaced by it in two years.

For the season 1916-17, seed-supply fields will be planted for this purpose with seed of the Douglass' type (No. 2 of the British Cotton Growing Association's report), and of the Heaton 9 types (Nos. 8 and 11). As growers will understand, it is necessary to exercise considerable caution in the distribution of seed of new strains for cultivation on a large scale.

MANURIAL EXPERIMENTS WITH COCO-NUTS IN CEYLON.

The following statement of the results obtained from these experiments is referred to in our review of the Report for 1915 on the Department of Agriculture, Ceylon, in another place in this issue. The information below is taken from the *Tropical Agriculturist* for October 1916:—

The manurial experiments with old coco-nuts begun in 1911 have not been completed, and the final detailed results will be issued as a bulletin. The general result of the manuring has demonstrated that such old coco-nuts (fifty years and over), which represent an enormous acreage of the small native holdings in Ceylon can be improved in vigour and yield by cultivation and manuring. The average yield per palm has steadily increased from 26·7 nuts in 1911, to 42·1 nuts in 1914 and 42·7 nuts in 1915—an increase of 60 per cent. No manure was applied in 1915 on account of war economy. The application of a complete general mixture gave the largest number of nuts, raising the yield from twenty-nine nuts per palm to fifty-seven nuts or 96·5 per cent., at a cost of Rs. 25 per acre. The application of a soluble mixture every six months gave even a larger increase from 23·4 nuts to fifty-four nuts per palm or 131 per cent., at a cost of about Rs. 25 per acre per annum

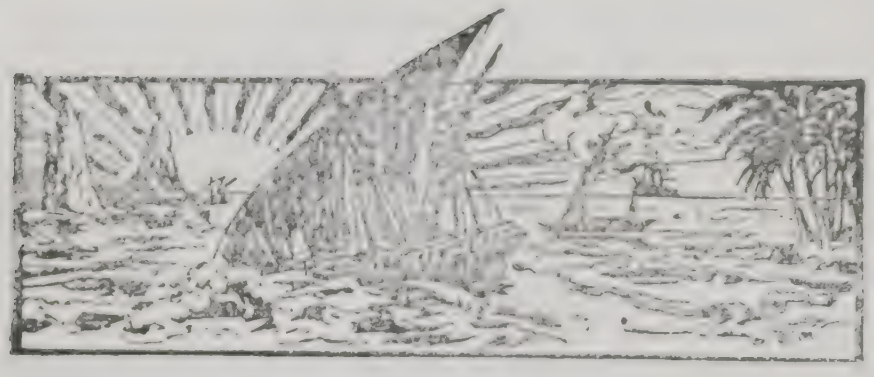
The most remunerative return was obtained by digging in or mulching round the palms with the sensitive plant (*Mimosa pudica*) and other weeds, and applying a mixture of basic slag and kainit in equal parts at 400lb. per acre. The mixture cost about Rs. 11 per acre. The yield per palm increased by this treatment from 30·7 nuts in 1911 to 55 nuts in 1914 and 56 nuts in 1915.

A feature in the manuring results is the increased power of the palms to retain the young nuts, although 44 per cent. are still lost annually. Before 1914 the proportion of immature to mature nuts was always greater, but since 1913 a steadily increasing proportion of nuts have matured, viz. 37·5 per cent. in 1913, 51 per cent. in 1914 and 56 per cent. in 1915.

The number of nuts required for a candy of copra (560lb.) is still much higher than in the low country, the average being 1,613 nuts.

The general appearance of the palms has much improved, the foliage being of a richer dark-green and the fronds heavier. Several manurial experiments with young coco-nuts are being carried out, but results are not yet available for publication.

One of the interesting series of papers issued by the States Relations Service, United States Department of Agriculture, in regard to agricultural education, is Bulletin No. 392, entitled, 'Lessons on Tomatoes for Rural Schools'. This bulletin is intended principally for teachers in the rural schools of the Southern States, which adds to its value for schools in the West Indies. The lessons are divided amongst a number of different topics, and arranged for certain months of the year during which each particular topic like that of harvesting, or training, pruning and cultivating, can be most conveniently studied. The bulletin includes sections concerning club organization and community exhibits. It should prove useful to those engaged in agricultural education in the elementary and secondary schools of the West Indies, since it is suggestive as regards the framing of lessons on related subjects.



GLEANINGS.

On December 5 the following products were shipped from Dominica by the S. S. 'Spheroid': lime juice, 350 puncheons and 103 hogsheads; cacao 350 bags; sugar 173 bags; citrate of lime 44 packages; and 60 boxes of fruit. By the S.S. 'Parima' on December 6, 300 barrels of limes were shipped.

It is stated in the *Journal of the New York Botanical Gardens* for October 1916, that a valuable collection of ferns from the Hawaiian Islands has recently been added to the Garden herbarium. A collection of over 500 specimens of ferns and flowering plants has also been received from various parts of Mexico.

Determination to displace German goods in the chemical apparatus trade is shown by the enterprise in sending out displayed samples of filter paper by a leading Maidstone firm in England. The samples are of various kinds, and printed notes are attached as to cost and quality. Hitherto a large amount of chemical apparatus trade has been in the hands of the Teutonic Powers.

We have been furnished by the Director of the Botanic Station, Seychelles, with a copy of an address delivered before a meeting concerning the culture of Para rubber and the preparation of rubber in that Colony. The address deals with various aspects of the question, such as tapping, coagulation, drying, and financial returns, and is a useful summary of the position of rubber cultivation in the Seychelles.

In the *Journal of Agricultural Research* for November 6,1916 (Vol. VII, No. 6), there is a paper which explains the nature and importance of the grain of tobacco leaf. This grain is a pimply appearance on the leaf caused by distension of the cells owing to the presence of small masses of crystalline substance. It has been found that there is a correlation between the grain and burning properties, the mineral substances being injurious in this respect.

It is shown in *Colonial Reports*—Annual, No. 887, on Fiji for 1915, that this Colony does a very considerable trade in bananas with Australia, though during the year under review some loss was occasioned by high winds and a flood. It is believed that a trade in pine-apples, mandarins, and sweet potatoes could be more largely developed with Australia and New Zealand. The cultivation of coco-nuts in the Colony continues to grow notwithstanding extraordinary conditions which, during the year, have unsettled and restricted the copra market.

According to *Colonial Reports*—Annual, No. 904, dealing with Ceylon during 1915, there has been a general increase in that Colony in crime against person and property. It is pointed out that the proportion of murders and crime generally to population in Ceylon is three times as high as in the neighbouring continental Madras Presidency. In Ceylon a murder is committed every other day. This is exclusive of the criminal disturbances that occurred during 1915, necessitating the institution for a time of marshal law. It has been found necessary to strengthen the Police Force and increase the number of court sessions.

According to *Colonial Reports*—Annual, No. 904, on Ceylon for 1915, an attempt has been made to supply elementary agricultural instruction by a scheme of school gardens conducted in connexion with government schools. The gardens are under the supervision of the Department of Agriculture; there is a Superintendent of School Gardens, who is assisted by three inspectors. School gardens numbering 287 attached to Government schools are worked under this scheme, and fifty-six grant-in-aid schools receive garden grants. Seeds and implements are supplied by the Department of Agriculture, and prizes are offered for competition.

An editorial in the *West India Committee Circular* for November 16,1916, gives an account of the Rhodes Scholarship Scheme, and draws attention to the fact that now those scholarships which were allocated to Germans have been withdrawn, it will make available an extra number for the British Empire. It is held that the one scholarship at present allocated to Jamaica cannot be considered adequate recognition for the West Indies, and it is urged that now that changes are to be made, three more should be given to the West Indies for competition in Trinidad and Tobago, British Guiana, the Windward and Leeward Islands, the Bahamas and British Honduras. A system of rotation is outlined.

The action of manganese under acid and neutral soil conditions is the subject of *Bulletin No. 441* of the United States Department of Agriculture. It appears that the productivity of the soil can be increased by manganese under neutral or slightly alkaline conditions. With wheat, rye, timothy, beans, corn and cowpeas, the yields were increased. It is stated that manganese decreases the oxidation in acid soils, which is in harmony with the decreased yield on such soils; but its action in increasing the oxidation of neutralized soil is in harmony with the increased yield. It is therefore necessary thoroughly to lime soils before adding manganese sulphate, which may then be applied with advantage at the rate of 50 lb. per acre.

The question as to whether cacao shells when fed as fodder are poisonous to stock is discussed in *Tropical Life* for October 1916. Although cases have occurred in which horses have died after consuming rations containing large amounts of this by-product, there is other evidence to show that this by-product can be consumed in moderate quantities without harmful effects whatsoever. From a physiological aspect it would appear that the subject requires further investigation, though, of course, cacao shells being a by-product in the manufacture of cocoa makes it a matter for investigation by the manufacturers themselves. In the same issue of *Tropical Life* the value of cacao shells as manure is pointed out. The substance appears to be of particular value in nursery work.

CO-OPERATIVE CREDIT IN CEYLON.

The *Monthly Bulletin of Economic and Social Intelligence*, for September 1916, contains an article on the subject of co-operative credit in Ceylon, which should be of interest in the West Indies, where co-operative credit societies have now for some time been in successful operation. From this we abstract the following information, which should receive due appreciation by readers of the *Agricultural News* resident in those colonies where co-operative credit societies at present exist, especially in regard to the variations in the working of the Ceylon societies, which should be noted.

Conditions of rural life in Ceylon differ in several respects from those in the European countries in which co-operative credit has developed. The peasant in Ceylon is generally a freeholder. His holding is indeed very limited in extent, but nine-tenths of the population can call themselves landowners. The usurer is for the most part non-existent, although certain districts are not entirely free from him, and although the evil he represents is one which seems to grow with years. The peasant's indebtedness to the capitalist landlord increases daily, and the latter, desiring eventually to acquire his holding, advances money to him at a high rate of interest.

The history of the organization, and the working of co-operative credit societies in Ceylon, may briefly be summarized as follows· In 1909 the Government nominated a commission which had the duty of making an enquiry into land and credit banks. Its report, published in 1910, was followed by Ordinance No. 7 of 1911 'for the constitution and control of co-operative credit societies for the encouragement of thrift and self-help, and of co-operation among agriculturists, artizans, and persons of limited means.'

On April 28, 1914, thanks to the propaganda of the Ceylon Agricultural Society, whose secretary published a popular pamphlet in the vernacular, thirty-five local societies were in full working order, and twenty-one others were in course of formation. Each of these societies except one has a capital composed of very small shares, which can be bought by the poor as well as by the rich. Each member may possess several shares, but the number of his shares is limited. The subscribed capital of the thirty-five societies in full working order reaches a total of 101,500 rupees*—an average of 2,900 rupees for each society. The total paid-up capital at the end of 1913 was 8,202 rupees—an average of 342 rupees to each society in full working order.

Persons of either sex can belong to a co-operative society so long as they are domiciled within the territory reserved by it as its sphere. Nothing is required of them saving that they be of good character. At the end of 1913 the total membership of the societies was 1,820. The maximum membership of any one society was 176, the minimum 52. Nine societies have adopted the rule of limited liability of their members; the rule of unlimited liability has been adopted in the twenty-six others.

Loans are made especially, but not exclusively, with a view to agriculture. They are made also for the encouragement of small industries—carpentry, pottery, basket-making and so forth—and, finally, to help to free the members of the societies from debts incurred to those not members. The loans are all for short periods: none has been made for more than a year. Up to April 28, 1914, they numbered seventy, and reached the total sum of 3,816 rupees. The amount of each varies from 5 to 250 rupees, the latter sum constituting, so far, the maximum. The security for these loans, fixed by the rules, varies with the societies: some take into account the borrower's contribution to the society's capital; others leave the directing committee to decide each case on its merits. One or two societies have established the principle that members of committee cannot obtain loans while they are in office. This rule is in force in all the societies as regards the president.

The rate of interest, which is always fixed by the rules, varies with local conditions. The lowest rate is 6 per cent.; the highest 12 per cent.: in other words, 1 rupee a month for a loan of 100 rupees. These figures may seem very high to European and also West Indian readers, but it is important to compare them with the rates at present demanded by private individuals in Cyelon. Such rates are never less than 36 per cent., and often surpass this figure considerably.

As touching the disposal of funds, a society cannot dispose of its reserve fund, which, according to the rules of all the societies, must be deposited in the Ceylon Savings Bank, whence it cannot be withdrawn without government authorization. The relations of the societies to the Post Office Savings Bank are the subject of a special Ordinance. The Savings Bank opens with all the societies especially privileged accounts. Needless to say, the treasurer of each society can keep in his safe a certain sum for immediate needs. At the end of 1913, a sum of 3,940·50 rupees was lying to the credit of the societies in the Post Office Savings Bank.

Finally, the Government contemplates the granting of loans to the co-operative credit societies, and has awarded a sum of 600,000 rupees to be allocated in loans to native agriculturists. To obtain a loan societies must:

(1) be registered;

(2) obtain the consent of the Government to their choice of a President.

Hitherto only one society, that of Walapane, has obtained a loan. This society, which has 112 members, and a subscribed capital of 1,000 rupees, has borrowed 660 rupees from the Government.

*Under the Act of 1899, the pound sterling is legal tender for 15 rupees.

CONCENTRATING LIME JUICE BY FREEZING.

With reference to the note which appeared in the *Agricultural News* for November 18, 1916, on page 379, under the above heading, describing the results of experiments with lime juice in Dominica, the Hon. J. Spencer-Hollings, of Nevis, has furnished this Office with an account of an interesting experiment made by him in connexion with the same idea many years ago.

The apparatus employed in this experiment was one of Carrés' ice machines. This proved a much more rapid and effective means of concentrating than by freezing only. The liquid to be concentrated in this machine is kept in vacuo by an air pump, and is also in direct communication with a chamber of sulphuric acid, which absorbs the vapour as soon as it is produced; and not only does it do this, but owing to the vacuum that is produced by the air pump, the liquid as it approaches freezing point assumes a condition of ebulition, which greatly accelerates the concentration. The resulting concentrated juice, not having been warmed, still retained the colour and appearance of freshly squeezed lime juice, and as thick as the dark-brown product now made. When diluted with water, it had all the flavour of the fresh lime, and made an excellent beverage. Mr. Hollings states that after a lapse of at least two years he re-examined the cordial and found it still retained its characteristics.

FUNGUS NOTES.

THE FUNGUS ON CACAO THRIPS.

Reference has been made in this Journal (Vol. XV, p. 110) to a fungus collected on cacao thrips (*Heliothrips rubrocincta*) in St. Vincent by Mr. W. N. Sands, Agricultural Superintendent in that island. It was then stated that the fungus has every appearance of being parasitic, being found on larvae as well as adults under circumstances which suggest no other cause of death. It occurs as a white mould on the body of the insect, attaching it lightly to the leaf. Under a strong lens the conidia are seen in small globular masses, heaped up on the insect or strung on hyphae around it. Further material having been recently forwarded by Mr. Sands, specimens were submitted to Professor Roland Thaxter, of Harvard University, who has kindly replied as follows: 'I have examined the fungus on thrips communicated by Mr. Nowell and am able to confirm his opinion that it is *Sporotrichum globuliferum*, a very general parasite among insects, although I have not seen it previously on this type of host.'

The fungus named has had a great deal of attention paid to it in the United States as the cause of an epidemic disease of the wide-spread and serious pest known as the chinch bug (*Blissus leucopterus*).

It was first described by Spegazzini, from material occurring on the dead bodies of beetles in Argentina. In the United States, a number of species of beetles, Lepidopterous larvae, and various other insects have been found to be susceptible to attack. Its effects on the chinch bug under favourable conditions are very striking.

'Going to the place in a field (generally a wheat field) where the fungus has been introduced, the track of the chinch bugs as they moved in any direction was in many cases almost literally paved with the dead bugs more or less enveloped in their winding sheets of white. Along ravines, dead furrows, or other depressions, the ground would be nearly white, the dead diminishing in numbers as the higher grounds were reached, though these were by no means free from corpses. In one instance the bugs had left a field of wheat at harvest, the Sporotrichum having been applied there before the movement began, and entered an adjoining corn field. The way was marked with white, not only the surface of the ground, but on stirring up the mellow soil of the edge of the corn field it was found to be literally full of dead chinch bugs to the depth of 2 or 3 inches, the white fungus-covered bodies strongly contrasting with the black colour of the rich loam. Not only this, but under the sheaths of the leaves and on the leaves themselves hundreds of dead were to be found on the outer rows of the corn, on the grass and weeds, and, indeed, almost everywhere. Millions of chinch bugs were certainly destroyed in this one field.' (F. M. Webster, *Bulletin 69*, United States Bureau of Entomology, page 55.)

As affording the most conspicuous example of the exploitation of a fungus as a remedy for an injurious insect, and for the evidence afforded as to the limitations of this type of control, it may be of interest to refer to Bulletin 107 of the United States Bureau of Entomology, by Professors F. H. Billings and P. A. Glenn, which deals with the results of the artificial use of this fungus against the chinch bug in Kansas.

In June 1865 during moist warm weather an epidemic was noticed amongst chinch bugs in a locality in Illinois so severe that in a few weeks scarcely one in a thousand of the vast hosts of young bugs observed in the middle of June remained alive.

The idea of a fungus parasite was at that time ridiculed by the most authoritative American entomologists, but confirmation was afforded nearly twenty years later when a species of Empusa was found to be killing off chinch bugs in several localities, and the fungus under notice was found on the same host in five states of the Union.

Experiments in the dissemination of the fungus were soon begun, both with dead insects and with cultures on a mixture of beef broth and corn meal.

Being followed by severe epidemics amongst the insects in various localities they were considered to have been very successful. In 1890 chinch bugs in Kansas were very scarce, having been very generally exterminated in the previous year. It was, however, doubtful how far artifical distribution was responsible for the outbreaks of the disease.

In 1891 the University of Kansas was directed by the legislature to propagate the fungus and distribute it free of charge, and some forty to fifty thousand packages of infected material were sent out. The method became popular in other States and distribution was continued for several years.

Doubts as to its efficiency began to be expressed by competent authorities, and in time the practice of artificial distribution was abandoned. It was found that when the conditions were favourable in respect of temperature, humidity of the air, and abundance of the insect, the disease appeared and did great execution whether the fungus had been artificially introduced or not, but that when the conditions were unfavourable no amount of artificial distribution would produce effective results.

The results of exhaustive experiments made by the authors of the bulletin quoted confirmed these conclusions. They found moreover, that the fungus was present in the soil of the infested area in such abundance that artificial distribution was quite unnecessary.

The extent of the occurrence of the fungus on the cacao thrips in these islands, and the possibilities of increasing its range and efficiency, are matters for investigation. It is hoped that search will be made in suitable situations, and any suspected material forwarded through the local agricultural officers for examination. The fungus is very easily cultivated, and some experiments are already being made in its distribution.

W.N.

MULCHING SUGAR-CANE.

While Cuba seems to have the monopoly of producing sugars more cheaply than any other country in the world, still it is done with an enormous outlay of capital, and done in competition with other tropical countries that apparently spend less money in sugar production than do the Cubans, and this naturally leads to an inquiry—why it is so. The soil and climate of Cuba, as far as they have been exploited in the sugar industry, are extremely well adapted to sugar production, and the supply of land has been so plentiful and the prices of land so moderate, that the great sugar producers have been disposed to gather crops of sugar-cane from certain lands say for a generation, and then to abandon the old fields for new ones that they have had in course of preparation, and thus go on from decade to decade, cane, as reported to us years ago becoming unprofitable on the north side at the end of eight years, and then requiring replanting and becoming unprofitable on the south side in twelve to fifteen years, and then becoming unprofitable, or at least less profitable than to replant the same fields again and to get larger crops that would more than pay for the difference in cost.

We are led to these reflections, based upon experiments recently made in Cuba with a sugar-cane harvester, in which it was found that to cut the canes at the ground line the machine was compelled to cut through a large quantity of cane trash utilized for mulching the growing cane crop, and thus retaining the moisture in the ground, retarding its evaporation, and the canes thus getting a monopoly of all the moisture the land contained.

As against this, we in Louisiana, with our more intense cane culture, count generally on getting two crops of cane from one planting; the first, called the plant cane crop, the canes being planted in the fall or early Spring, and the second crop coming off a year later, being known as the crop of first ratoons. Second ratoons are grown to some extent, but by the best cultivators such culture is thought inadvisable, and second ratoons have been practically abandoned in Louisiana. In Louisiana we have generally an adequate rainfall, and we have bottom water not very far below the surface. We thus find that we do not need the mulching that is utilized in Cuba for the retention of the moisture, and get our mulching with the upper 2 inches of surface soil, which during the earlier growing season can be done with weekly working with horse hoes. As soon as the plants are large enough to shade the cane rows, which are ordinarily 6 feet apart, such cultivation ceases, and ordinarily the moisture in the soil is adequate to carry the crop on to maturity and, in fact, it is generally reported that the drier autumns, say, at least from the first of September onward and possibly from the first of August onward, give us the finest cane crop.

This difference in the climatic conditions and in climatic exigencies constitutes a difference between our culture and that of Cuba that has not yet been studied. We do know that Cuban cane fields are very liable to be attacked by fire, and we can readily see that, aside from the green plant canes growing, the immense mulch of old cane trash on the soil creates a danger that does not exist in Louisiana, and yet that has cost hundreds of thousands of dollars to the Cubans.

In Louisiana it is thought that to whatever extent the cane trash can be ploughed into the ground sufficiently early to rot it in such a way as will prevent its interfering with subsequent culture, is very advisable. The retained vegetable matter, developing humic acid, sets free the mineral constituents of the soil which promote the growth and maturity of the cane plants, and in this way gives to us an advantage in Louisiana that offsets in degree the gains that Cuba has in the retention of moisture by the cane trash mulch on her soils

With increasing cane culture and greater care in sugar-cane production, and the fact that other tropical cane countries cannot do as Cuba does, apparently lead to the conclusion that the Cubans will soon be changing their methods into the regular cultural methods practised in most other tropical cane countries. We presume that they never will do the immense amount of hand labour in the field that is practised in Barbados, which island is probably the most advanced place in the world in tropical cane culture, looking at it from a physical point of view. Cuba will avail of machinery as rapidly as she can. It is a generally recognized fact that Cuban cane is short-jointed, and when very long is very apt to be slender and does not give the average weight per acre or per hectare or per cabelleria that is expected as an average, and does give a weight of cane produced which in fact scarcely averages better than the average we get in Louisiana, say, 16 to 17 tons for ratoon canes, and 19 to 20 tons for plant canes. (*Louisiana Planter*, November 25, 1916.)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKETS.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets, for the month of October:—

The drug and spice markets during October have been conducted throughout the month with but very little change, either in bulk or prices, since our last report for September. Buyers continue to be very chary of buying in bulk, and continue to be satisfied by purchasing only in quantities to meet immediate wants. The following are the chief details.

GINGER.

This has been in very slow demand. At auction at the end of the month the quotations were as follows: Fine Jamaica 110*s.*, middling to good 90*s.* to 100*s.*, and common to good 80*s.* to 85*s.* Some 323 bags of rough washed Cochin were also offered, of which 70 bags of wormy fetched 30*s.* per cwt. A very quiet tone has prevailed with pimento throughout the month, at the end of which it stood at $3\frac{1}{16}d.$ to $3\frac{1}{8}d.$ per lb.

SARSAPARILLA.

This drug has been in very little demand. The offerings at auction on the 19th of the month were as follows: grey Jamacia 32 bales, native Jamaica 15, Mexican 54, and Guayaquil 9. Of the grey Jamaica only 6 bales were sold at 1*s.* 10*d.* per lb. for fair, and of native Jamaica, only 2 bales found purchasers, fair native red fetching 10*d.* per lb. None of the Mexican or Guayaquil was disposed of.

CITRIC ACID, LIME OIL, LIME JUICE, ANNATTO SEED, KOLA, CASHEW NUTS, AND CASSIA FISTULA.

At the beginning of the month the quotation for citric acid was 2*s.* 9*d.* per lb. A week later it dropped to 2*s.* $8\frac{1}{4}d.$, and in the course of another week to 2*s.* $7\frac{1}{2}d.$ to 2*s.* 8*d*; at the close of the month it stood at from 2*s.* $7\frac{1}{2}d.$ to 2*s.* 8*d.* West Indian distilled lime oil was well represented at the early part of the month when considerable quantities changed hands at 9*s.* per lb. for distilled and 11*s.* per lb. for hand-pressed. Towards the end of the month it was stated that these prices had slightly advanced. Fair raw West Indian lime juice was quoted in the middle of the month at 3*s.*3*d* per gallon, which price has remained steady through the month Annatto seed was represented at the auction on the 19th of the month by 21 packages, but failed to find any purchaser. Kola was also well represented by 167 packages; only 69 however found buyers at $5\frac{3}{4}d.$ per lb. for small to bold, slightly dark Ceylon halves; 3*d.* per lb. was paid for mouldy and wormy; sea-damaged ranged from $4\frac{3}{4}d.$ to $5\frac{1}{4}d.$ Sixty packages of cashew nuts were also offered at the sale on the 19th but not one was sold; on the other hand, 9 bags of Cassia Fistula from Dominica were disposed of at 37*s.* per cwt. for bold, part wormy.

Information has been received in answer to an enquiry from this Office as to the price of the Diston tree-pruning saw which is in use on some estates in Dominica. It appears that the frame and one blade cost $18 per dozen. Extra blades cost 15c. These saws, which answer their purpose very satisfactorily, can be obtained from Henry Diston & Sons, 302, Broadway, New York.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 19, 1916.

ARROWROOT—$2\frac{15}{16}d.$ to $4\frac{1}{2}d.$
BALATA—Sheet, 3/3 to 3/6; block, 2/3½ to 2/4.
BEESWAX—No quotations.
CACAO—Trinidad, 84/- to 85/-; Grenada, 80/; Jamaica, 81/--
COFFEE—Jamaica, no quotations.
COPRA—£34 to £34 10*s*.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14*d*. to 21*d*.
FRUIT—Bananas, £17 per ton; Oranges, Jamaica, 15/- to 17/- per case.
FUSTIC—No quotations.
GINGER—Jamaica, 85/- to 110/-.
ISINGLASS—No quotations.
HONEY—Jamaica, no quotations.
LIME JUICE—Raw, no quotations; concentrated, £22; Otto of limes (hand-pressed), 10/- to 11/-.
LOGWOOD—No quotations.
MACE—6½*d*. to 2*s*. 10*d*.
NUTMEGS—No quotations.
PIMENTO—No quotations.
RUBBER—Para, fine hard, 3*s*. 3*d*.; fine soft, 3/-; Castilloa, no quotations.
RUM—Jamaica, 3/11 to 5/7.

New York.—Messrs. GILLESPIE BROS. & Co., November 28, 1916.

CACAO—Caracas, 14¾c. to 15½c.; Grenada, 14½c. to 15c.; Trinidad, 15½c. to 15¾c.; Jamaica, 11¼c. to 12¼c.
COCO-NUTS—Jamaica and Trinidad selects, $40·00 to $42·00; culls, $21·00 to $22·00.
COFFEE—Jamaica, 9½c. to 11½c. per ℔.
GINGER—14½c. to 17½c. per ℔.
GOAT SKINS—Jamaica, 90c.; Antigua and Barbados, 85c. to 90c.; St. Thomas and St. Kitts, 70c. to 85c. per ℔.
GRAPE FRUIT—Jamaica, $1·25 to $1·50.
LIMES—$4·00 to $4·50.
MACE—45c. to 51c. per ℔.
NUTMEGS—17c. to 17½c.
ORANGES—$1·50 to $1·75.
PIMENTO—5⅜c. to 6¼c. per ℔.
SUGAR—Centrifugals, 96°, 5·88c; Muscovados, 89°, 5·13c.; Molasses, 89°, 5·00c. all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., December 15, 1916.

CACAO—Venezuelan, $13·70 to $14·00; Trinidad, $13·50 to $13·75.
COCO-NUT OIL—$1·07 per Imperial gallon.
COFFEE—Venezuelan, 14½c. to 15c.
COPRA—$6·25 per 100 ℔
DHAL—$7·00.
ONIONS—$4·50 to $5·00 per 100 ℔.
PEAS, SPLIT—$10·00 per bag.
POTATOES—English, $5·00 per 100 ℔.
RICE—Yellow, $7·25 to $7·75; White, $7·40 to $7·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., December 13, 1916; T. S. GARRAWAY & Co., December 27, 1916

ARROWROOT—$5·00 per 100 ℔.
CACAO—$14·00 to $15·00 per 100 ℔.
COCO-NUTS—$24·00 husked nuts.
HAY—$1·75 to $1·80 per 100 ℔.
MANURES—Nitrate of soda, $90; Cacao manure, no quotations; Sulphate of ammonia, $110·00 to $112·00 per ton.
MOLASSES—No quotations.
ONIONS—$6·00.
PEAS, SPLIT—$9·75 per 210 ℔.; Canada, $6·00 per 120 ℔.
POTATOES—Nova Scotia, $4·25 to $6·00.
RICE—Ballam, $7·58 to $7·95; Patna, no quotations; Rangoon, no quotations.
SUGAR—Muscovado centrifugals, $5·25 to $5·50.

British Guiana.—Messrs. WIETING & RICHTER, November 30, 1916; Messrs. SANDBACH, PARKER & Co. October 20, 1916.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$11·00	$12·00
BALATA—Venezuela block	——	——
Demerara sheet	$65·00	68c.
CACAO—Native	15c. per ℔.	14c. per ℔.
CASSAVA—	96c.	——
CASSAVA STARCH—	$9·00	——
COCO-NUTS—	$20 to $24 per M.	$24 per M.
COFFEE—Creole	14c.	16c. per ℔.
Jamaica and Rio	15c. per ℔.	17c. to 18c.
Liberian	11c.	13c.
DHAL—	$6·50 to $7·25	$6·50 to $7·25
Green Dhal	——	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	2c.	——
Madeira	5c.	4c. to 4½c.
PEAS—Split	$12·00 to $12·50	$12·00
Marseilles	——	——
PLANTAINS—	32c. to 60c.	——
POTATOES—Nova Scotia	$5·00 to $5·25	$4·75 to $6·00
Lisbon	——	——
POTATOES—Sweet, B'bados	$1·92	——
RICE—Ballam	$7·00	——
Creole	——	$5·50 to $6·00
TANNIAS—	$2·88	——
YAMS—White	$2·40	——
Buck	—	——
SUGAR—Dark crystals	$4·50 to $4·70	$4·50 to $4·60
Yellow	$5·00 to $5·10	$5·00 to $5·10
White	$7·00	——
Molasses	——	——
TIMBER—GREENHEART	48c. to 72c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$5·50 to $7·50 per M.	$5·00 to $7·00 per M.
,, Cordwood	$3·00 to $4·00 per ton	——

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